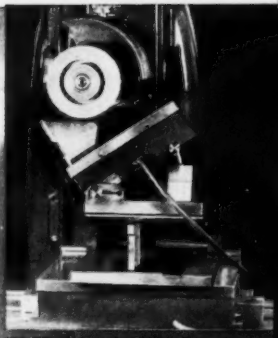
MACHINE TOOL BLUE BOOK

JUNE 1946

TIME SAVERS for Your ANGULAR SET-UPS



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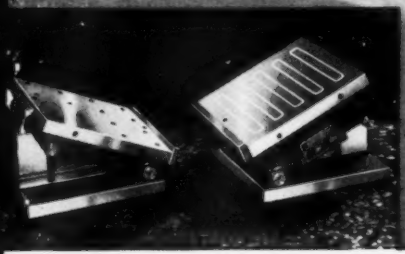
For holding securely any magnetic material at any angle, single or compound. Quick precision set-ups. Thousands are in regular use.



THE ROBBINS SINE PLATE

Made on the same principle and with the same sturdy precision as the Magna-Sine, but is non-magnetic. Extremely useful for inspection, jig boring and many other operations.

THE UNIV-ANGLE

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MARVEL 18
for Size,
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for Volume Production

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In addition to the battery of MARVEL Automatics, Hammond & Irving have cutting-off capacity of a different sort in their MARVEL No. 18 Hydraulic Hack Saw—capacity for size because this roll-stroke giant cuts off billets and bars in sizes to 18" x 18" cross section. It easily handles the toughest and hardest steels.

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Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

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Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

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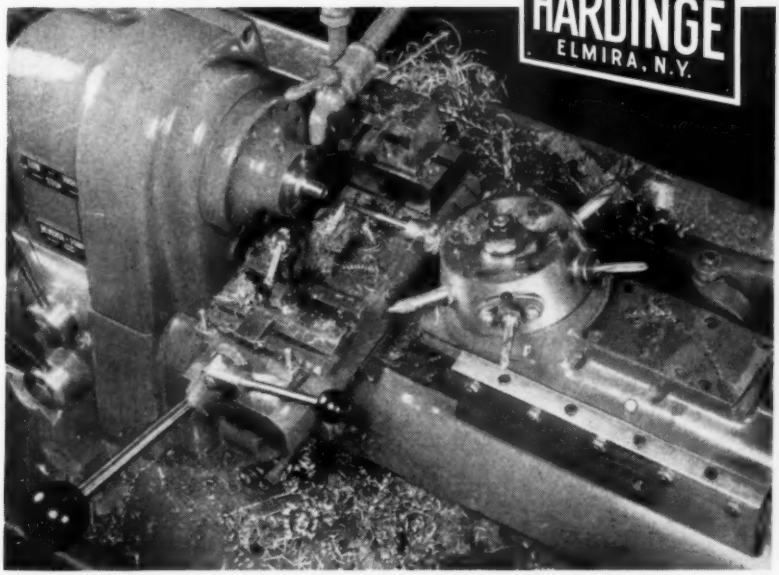
The New HARDINGE High Speed Precision Second Operation Machine



You need this machine for rapid and accurate production of parts requiring secondary operations

1" COLLET CAPACITY
9" SWING; SPEEDS TO 4000 R.P.M.

Above is a typical production run. The machine features hardened and ground steel dovetail ways, Hardinge center-drive preloaded ball bearing spindle, preloaded ball bearing turret head and hardened and ground turret slide ways. Write for bulletin DSM59 regarding additional features.

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Quality WRENCHES

These fine wrenches combine balance with great strength. Accurate openings assure a positive grip on screw head or nut. Engineered designs give increased leverage applied power. The finest wrench steels, drop forged, heat treated, tempered and tested, give extra strength . . . superior "tool sense" has created a line of superior wrenches.

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Drop Forged
Carbide STEEL

OPEN END
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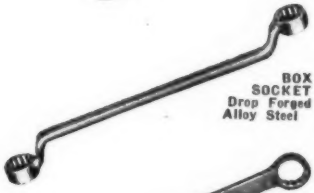
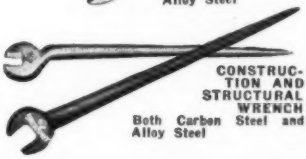


BOX
SOCKET
Drop Forged
Alloy Steel

COMBINATION WRENCHES
Open End and Box
Socket Drop Forged,
Alloy Steel



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Both Carbon Steel and
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Machine Tool Blue Book

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Published Monthly *Volume 42, No. 6*

JUNE 1946

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With CMD

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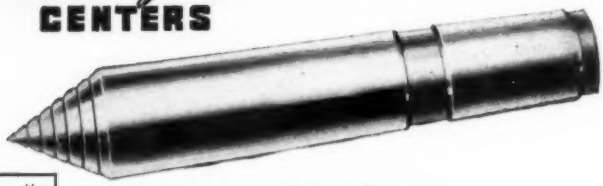

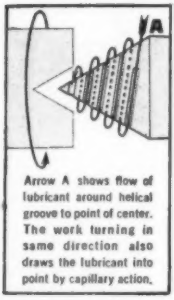

Arrow A shows flow of lubricant around helical groove to point of center. The work turning in same direction also draws the lubricant into point by capillary action.

The Exclusive Helical Groove
Carries the Oil to the Extreme Point of the Center

The extreme point of these centers and the entire bearing surface are always covered with a protective film of oil because the exclusive CMD *helical* groove conveys oil constantly to the point. Lubricant is never crushed or squeezed out. Center lasts longer. Work stays cooler. Send for descriptive circular now.

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Please send Catalog describing CMD Helical Groove Centers.

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A complete engineering service, backed by an experienced staff, is at your service to make recommendations and design special cutters.

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Hundreds of sizes, dozens of models to meet every requirement, regardless of machines used or materials to be cut.

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30 YEARS' SATISFACTION

Nearly 30 years' continuous experience making milling cutters and other "Positive-Locking" tools. Our first customers are still buying our tools.

...from tiny acorns grow

Lovejoy's business is based on a sound idea. Small in size? Yes. Big in importance? Yes. This sound idea is the "Positive-Locking" device used to secure the cutting blades in Lovejoy Milling Cutters. It consists of just two parts — the serrated shoe and the locking wedge. Tools needed for blade adjustment consist of a pin and hammer.

It is simplicity itself, yet blades are held immovably, even under the strains imposed by negative rake carbide cutting practice — even when these cuts are intermittent.

Lovejoy makes superior milling cutters—has experienced engineers to help on any standard and special applications—has a range of models and sizes for every job — has nationwide service for your convenience.

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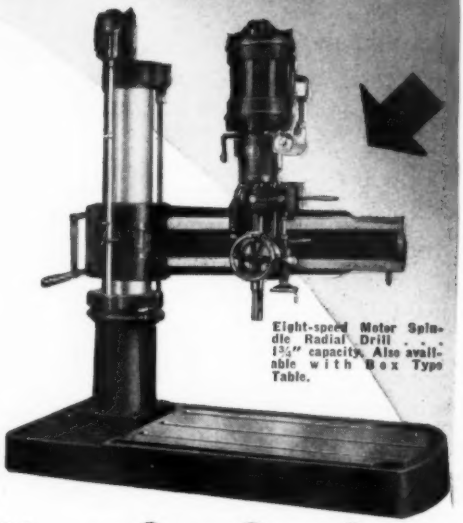
SPRINGFIELD, VERMONT, U. S. A.

CANEDY-OTTO

RADIAL DRILLS

Made in three models . . . 3, 4 and 5 foot arms . . . with all the advantageous features of more expensive drills. Yet Canedy-Otto Radial Drills are simple in design and have the necessary controls and flexibility to meet exacting production requirements. New features have been included which combine to make C-O equipment the most desirable in the field. Some of the specifications are indicated below and more detailed information is yours for the asking. Write today.



Eight-speed Motor Spindle Radial Drill . . . 1¾" capacity. Also available with Box Type Table.

SPECIFICATIONS

	3 x 9	3 x 11	4 x 11	5 x 11
Drills to center of circle on base or table	73½"	73½"	96"	120"
Maximum distance spindle nose to base	43⅝"	48"	48"	46"
Minimum distance spindle nose to base	9½"	15"	15"	17"
Minimum distance center of spindle to column	10⅜"	10"	10"	10"
Length of arm	3'	3'	4'	5'
Traverse of spindle	10"	10"	10"	10"
Diameter of column	9"	11"	11"	11"
Standard Morse taper bore of spindle	No. 4	No. 4	No. 4	No. 4
Bearing of arm on column	14"	16"	16"	18"
Traverse of head on arm	25¾"	26"	36½"	48½"
Traverse of arm on column	21¼"	24"	24"	22"
Spindle nose diameter	2 11/32"	2 11/32"	2 11/32"	2 11/32"
Diameter of spindle	1¼"	1¼"	1¼"	1¼"
Speeds (8) 1800 R.P.M. motor		all models		
Direct Drive—1750-1160-860-560 R.P.M.				
Back gear engaged—274-180-130-85 R.P.M.				
Speeds (8) 1200 R.P.M. motor		all models		
Direct Drive—1200-860-560-475 R.P.M.				
Back gear engaged—180-130-85-60 R.P.M.				
Speeds (12) 1200 R.P.M. motor		all models		
Direct Drive—1200-860-560-475 R.P.M.				
Single back gear engaged—180-130-85-60 R.P.M.				
Both back gears engaged—31-23-14-12- R.P.M.				
Feeds (4)	.004"	.004"	.004"	.004"
	.007"	.007"	.007"	.007"
	.010"	.010"	.010"	.010"
	.020"	.020"	.020"	.020"
Overall height	100"	107"	109"	109"
Height of base	6"	6"	8"	8"
Working surface of base	29x45"	29x45"	36x60"	36x88"
Overall dimensions of base	36x74"	36x74"	44x91"	44x102"
Net weight	4400 lbs.	5155 lbs.	7190 lbs.	8025 lbs.
Crated weight	5230 lbs.	5992 lbs.	8230 lbs.	9630 lbs.

Box table size—16x24x24" with 12x24" side apron
Weight of box table
Net—575 pounds
Crated—643 pounds

Send today for full details of C-O Radial Drills. Also Floor and Bench type drills. No obligation.

CANEDY-OTTO MANUFACTURING CO.
CHICAGO HEIGHTS, ILLINOIS
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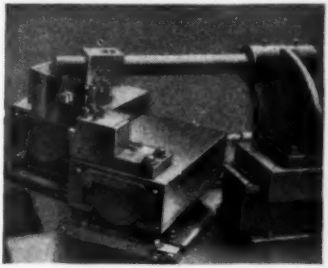
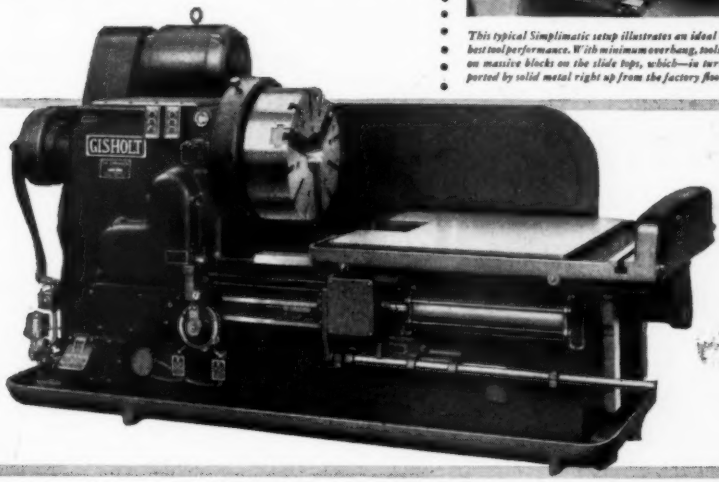
WHY tooling is more effective on the GISHOLT SIMPLIMATIC

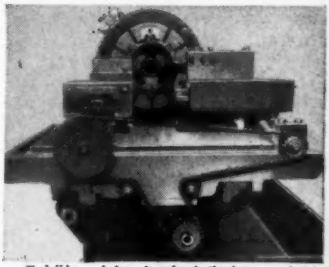


This typical Simplimatic setup illustrates an ideal condition for best tool performance. With minimum overhang, tools are mounted on massive blocks on the slide tops, which—in turn— are supported by solid metal right up from the factory floor



You can always place tools to best advantage on the large horizontal platen table of the Simplimatic. You can individualize the machine with a slide arrangement most suitable for the specific job, and have an ideal condition for each tool as to overhang, order of engagement, feed, dwell and retract.

Moreover, you have utmost rigidity for tool support. With slides as well as the heavy platen table resting on and against hardened and ground steel ways and gibs, there's no vibration or chatter. High-speed production, within close limits of accuracy, makes the Simplimatic the wise selection for large volume machining. Write for literature.



Tool slides are independent of each other because each slide is individually cammed. Slide top engages cam directly, eliminating all bars, beams, pivots or levers between the driving cam and the cutting tool. Pick-off gears and sprockets provide wide choice of feeds.

GISHOLT MACHINE COMPANY
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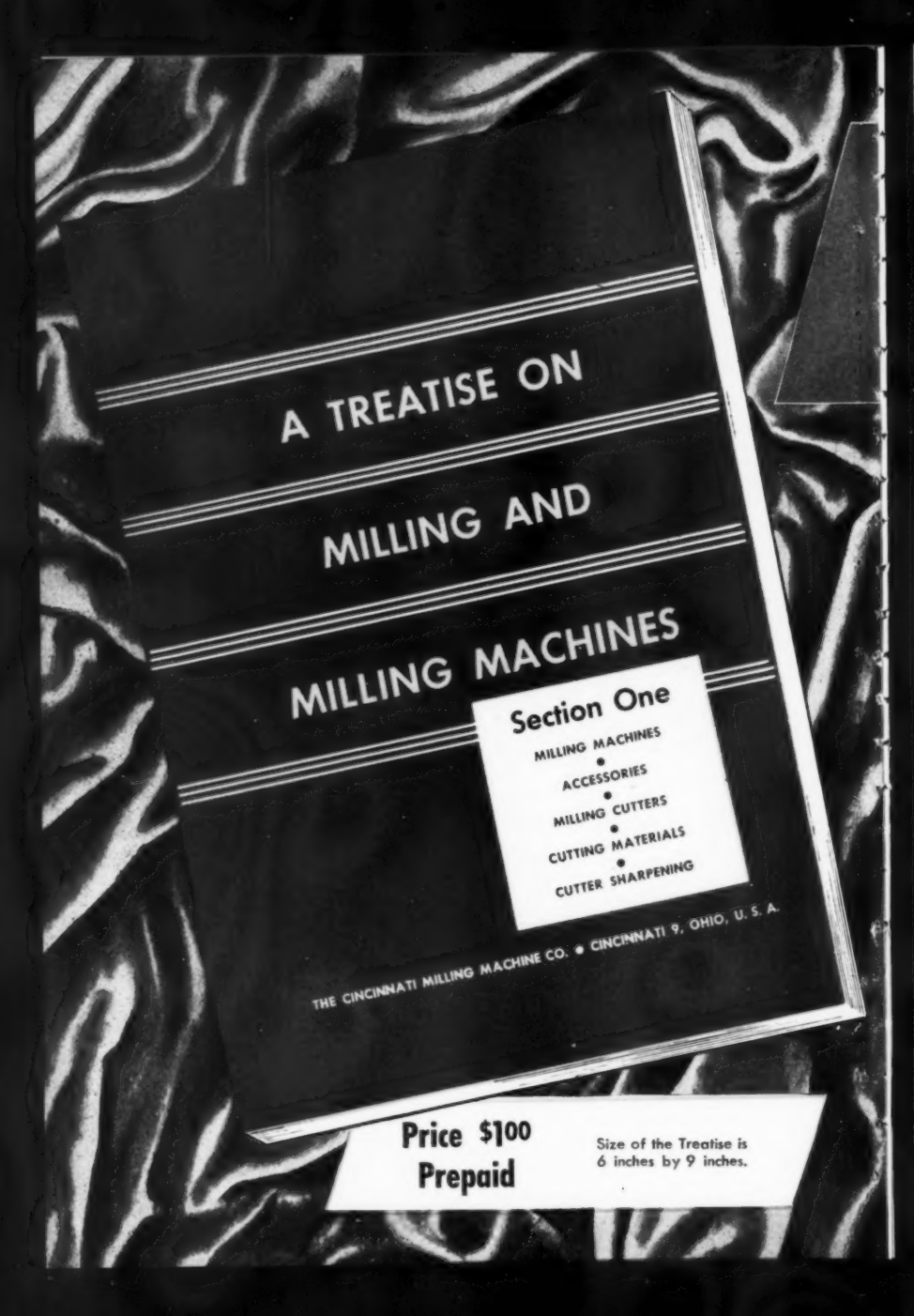
With Gisholt Improvements
In Metal Turning

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINE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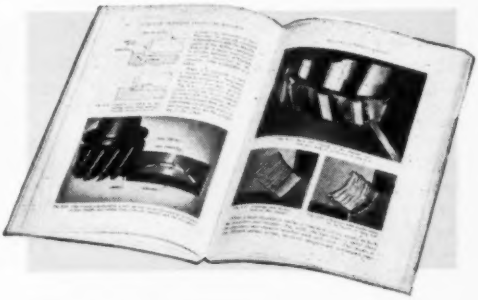
Typical pages of Section 1 of "Treatise on Milling and Milling Machines." This book contains definitions of milling machines and their accessories, and detailed data on cutters, cutter materials and cutter sharpening practice.



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THE CINCINNATI MILLING MACHINE CO.

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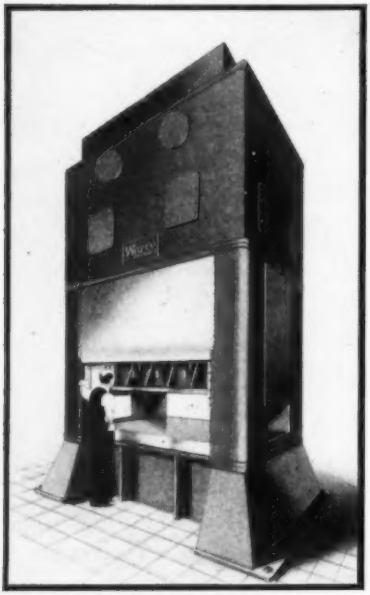

ECCENTRIC GEAR PRESS

Warco eccentric gear presses are built in capacity range from 100 to 1200 tons, stroke range from eight to 36 inches, and between housings range from 42 to 156 inches and longer. Welded steel construction makes it possible to include special features for special manufacturing.

All-Steel Welded

Construction, weldments fully stress-relieved for maximum

RIGIDITY ACCURACY
STRENGTH POWER
ENDURANCE

If you have been fortunate enough to receive a press within the past nine months, chances are that it was made entirely or in part by Warco's staff of experienced press engineers and craftsmen.

A portion of our tremendous engineering and production facilities have been and are now being utilized building presses and component parts for companies which have in the past handled the largest share of the nation's press business.

Through the new "Warco" line, we are making all of our facilities available directly to the trade. We are in good position to give prompt delivery. Get in touch with us today for full details.

A Complete Line of

Open Back Inclinable Models
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Straight-Sided Hydraulic Models
Mechanical Press Brakes

Check Our Prompt Delivery Policy

WARREN CITY MANUFACTURING COMPANY
1948 GRISWOLD STREET, WARREN, OHIO
A Subsidiary of The Federal Machine and Welder Company
Offices in Principal Cities

Equally efficient for grinding steel castings and snagging forgings, these husky "American" Wheels remove metal fast without sacrifice of wheel life and are enthusiastically endorsed by operators. Used on floorstands, swing and portable grinders, they increase production, cut production costs. Put these "American" high speed Aluminox wheels to work on your most difficult snagging jobs.

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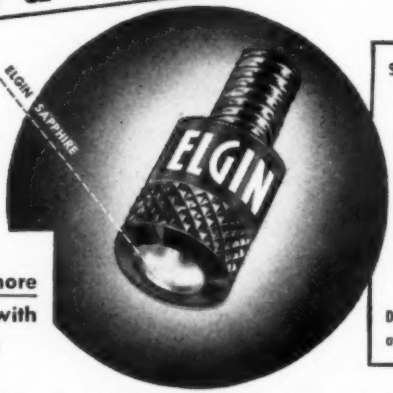

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Specifications of the dial indicator point shown

- Oil hardened steel body
- Thread 4-48 x .187
- Body .250 O.A.L.
- Body .187 O.D.
- Sapphire point radius .187

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Other Elgin Sapphire contact points can be furnished to your specifications to fit any dial indicator. Shown here are a few representative shapes.

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Elgin National Watch Company, Aurora, Illinois
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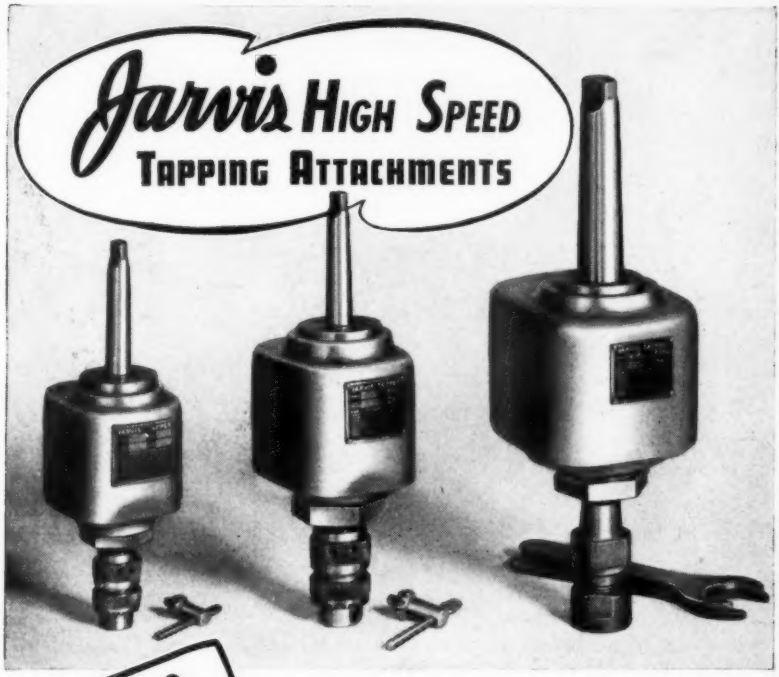
DIMENSIONAL FIDELITY IN GAGING OPERATIONS

Jarvis High Speed Tapping Attachments



Jarvis

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QUICK CHANGE CHUCKS AND COLLETS

They save Time and Taps

Jarvis Tapping Attachments for high speed production. Built for long, dependable service. Famous for long tap life and extreme accuracy. Save time and taps with Jarvis High Speed Tappers.

Send for our new catalog MFTI

THE CHARLES L. JARVIS COMPANY
MIDDLETOWN, · CONN.

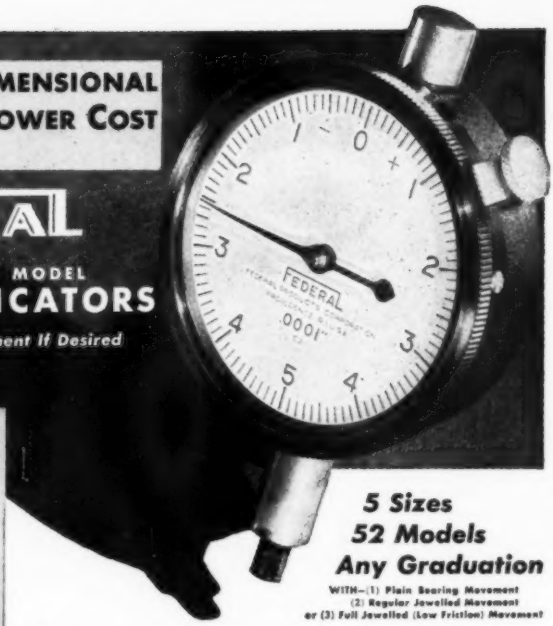
CONTROL DIMENSIONAL QUALITY at LOWER COST with . . . .

FEDERAL

IMPROVED MODEL

DIAL INDICATORS

Cushioned Movement If Desired



USE DIAL INDICATORS FOR INSPECTING—

Adjustments
Alignment
Angularity
Backlash
Balance
Contour
Clearance
Comparison
Cutting-tool Setting
Compression
Concentricity
Contraction
Deflection
Deformation
Depth
Eccentricity
Elongation
End play
Expansion
Flatness
Hardness
Height
Inside Diameter
Length
Load
Machine movements
Outside Diameter
Parallelism
Pressure
Relative location
Roundness
Runout
Side Play
Softness
Spacing
Squareness
Straightness
Strain
Taper
Thickness
Torque
Vibration
Width

5 Sizes
52 Models
Any Graduation

WITH—(1) Plain Bearing Movement
(2) Regular Jewelled Movement
or (3) Full Jewelled (Low Friction) Movement

Obtain the double-barreled advantage of lowered cost and improved output by simplifying both "in-process" checking and final inspection with Federal Precision Dial Indicators.

Analyze your manufacturing and final inspection procedures with these things in mind:—Are you using old-style or hastily improvised methods that are slow, costly and perhaps not as dependable as you would like? Is the percentage of rejects at final inspection or at assembly higher than it should be? Does work bottle-neck at the inspection point?

These and many other profit-eating troubles can be corrected with Federal Dial Indicators, the fool-proof inspection units that increase gaging speed and eliminate the element of human variation.

Write for further information on new and improved gaging methods to—

FEDERAL PRODUCTS CORPORATION

1144 EDDY ST., PROVIDENCE 1, R. I.

Color Films Available
No. 1 Dial Indicators. No. 2 Dial Indicator Gages. For instruction and training. Loaned on request.

FEDERAL MECHANICAL AIR and ELECTRONIC GAGES
PRECISION MEASURING INSTRUMENTS

Efficient means of selection—control in manufacture that leaves nothing to chance—economical, lasting sureness of performance—these are some of the winning qualities that swing the odds solidly in favor of peak production efficiency when you use Simonds Abrasive Wheels. Thousands of combinations of various types and sizes of grain in every required structure and bond make up the complete line of Borolon* (aluminum oxide) and Electrolon* (silicon carbide) products for all your production and tool room needs. For roughing, cutting, snagging or finishing, for effective, long lasting performance on any material from steel to plastics, Simonds Abrasive Wheels are your best bet. Grinding wheels of every size and shape; Segments, Mounted Wheels and Points; Grains, Bricks and Sticks give new economy and long lasting efficiency when used on the jobs for which they are intended.

You will find Simonds Abrasive distributors, located in all principal cities, eager and ready to help you select the particular Borolon and Electrolon product adapted to every specific job.

Time-honored Borolon Abrasive Products are now distinguished by the name Simonds.

SIMONDS ABRASIVE CO. *is a Division of* **SIMONDS SAW & STEEL CO.**

Other affiliated companies are Simonds Steel Mills and Simonds Canada Saw Co. Ltd.

SIMONDS
ABRASIVE CO.

Simonds Abrasive Company • Philadelphia 37, Pa. • Distributors in All Principal Cities

WINTER SERVICE IS 4fold

1. An Efficient and Helpful Distributor Organization

The Winter Brothers Distributor Organization has been carefully built to give maximum service — a service available to you for the asking.

2. Your Local Distributor Carries A Full Stock of Winter Taps

With stock shelves again fast filling up, your local distributor is performing a more important function than ever. He can give you immediate service.

3. An Experienced Engineering Staff to Cope with Your Problems

No sales organization is 100% effective without an engineering staff with the know how and research facilities to cope with new production problems — particularly threading tool problems.

4. A Quality Product Developed to Do a Better Job

This 3-Fold Service is built around a fourth — the Product. Winter Taps make for new threading accuracy, easier cutting, higher cutting speeds and longer tap life, the result of 45 years of tap making experience and research.

You get more production at lower cost from Winter Taps. Specify them — always!

Winter Brothers COMPANY

Wrentham, Massachusetts, U.S.A.

BRANCH STORES SAN FRANCISCO CALIFORNIA · CHICAGO ILLINOIS · DETROIT MICHIGAN

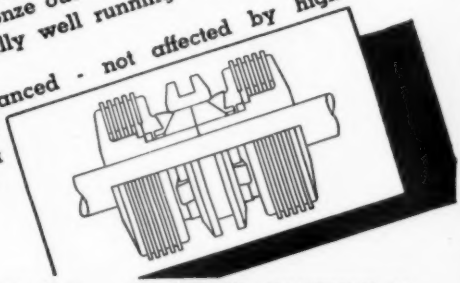
A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICHIGAN

a HANSON *Clutch*

FOR THAT SPECIAL INSTALLATION WHERE THE LOAD IS GREAT AND THE SPACE IS SMALL

Check These Seven features of the type "F" Multiple Disc Clutch specially designed for that heavy load in a limited space.

1. Transmission load: .40 H.P. to 24 H.P. at 100 RPM.
2. Compact - scientifically designed.
3. High quality materials and workmanship.
4. Hardened steel inner discs - special Hanson friction bronze outer discs.
5. Operates equally well running dry or in oil bath.
6. Perfectly balanced - not affected by high speeds.
7. Single point adjustment for wear

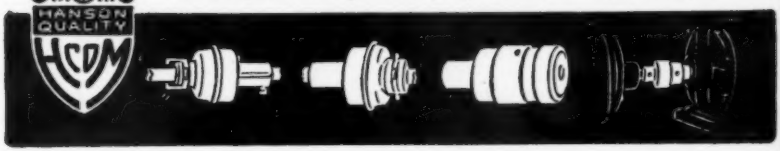


When you use Hanson Clutches you have "the right connections"! Send for catalog B-66. It gives you a lot of helpful information about clutches.

HANSON CLUTCH & MACHINERY CO.
TIFFIN, OHIO

HANSON *Friction Clutches*

for every clutch requirement, regardless of load or drive speed.



Time-Saving Money-Maker!

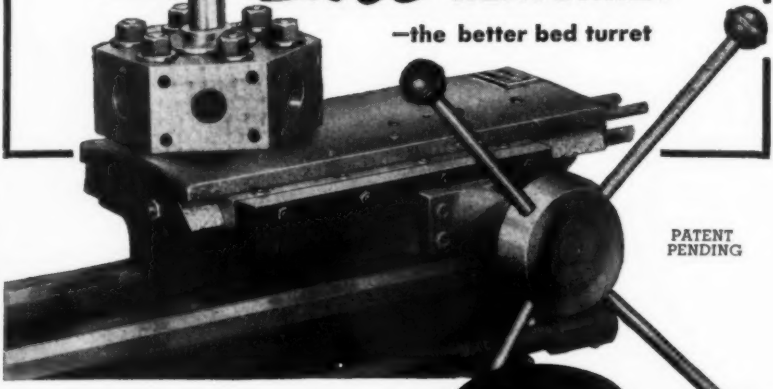
An Enco HEXTURRET performs every turret or screw machine operation and, in addition, almost any job done with the regular tailstock. Such versatility helps to offset rising production costs by cutting lathe time. Releases large machines for big jobs. Accuracy is protected. Enco HEXTURRET'S *double features* assure greater speed and accuracy . . . *and lower per-piece costs.*

Available for Atlas, Clausing, Logan, Powr-Kraft, Sheldon and South Bend 9" and 10" lathes.

Self-Indexing

Enco HEXTURRET

—the better bed turret



PATENT PENDING

Manufacturers of

ENCO Turret Tool Posts

ENCO'S "DOUBLE-DRIVE" PRINCIPLE

When a twin-engine plane flies on one engine, its power is unbalanced. In a turret a single drive and one gib, give the same effect . . . friction and wear increase. Enco's *double-drive* prevents wear and inaccuracy by equalizing power.

DOUBLE DRIVE FOR EQUALIZED POWER

DOUBLE GIBS FOR CONSTANT ACCURACY

Address Department 26

ENCO MANUFACTURING COMPANY

General Offices and Factory: 4522-24 Fullerton Ave. • Chicago 39, Illinois

DON'T PASS THIS UP!

IMPORTANT 60-SECOND STORY OF HOFFMAN FILTRATION BENEFITS . . .

★ PRODUCTION BENEFITS

Coolant control by Hoffman Filtration increases production, enhances precision finish and reduces rejects.

★ IMPORTANT SAVINGS

Clean coolant lengthens life of machines, cutting tools and grinding wheels; also reduces maintenance, as machines operate longer cycles without cleaning.

★ EXCLUSIVE FEATURES

Hoffman offers the flotation process for soluble oil and filter-aid and non-filter-aid equipment for all types of coolants and vacuum stills.

★ COOLANT TEMPERATURE CONTROL

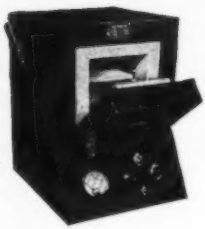
Some Hoffman models are self-cleaning and offer automatic sludge removal features. Hoffman refrigeration units aid in maintaining tolerances.

★ ENGINEERING SERVICE

Experts are available to help you determine sizes, flow rates, capacities, filtering area required, etc. We offer a filtration planning and layout service.

U. S. HOFFMAN MACHINERY CORPORATION
215 Lamson St., Syracuse, N. Y.

COOLANT FILTERS • FILTRATION ENGINEERING SERVICE



LUCIFER

ELECTRIC HEAT TREATING FURNACES

●

WITH AUTOMATIC HEAT CONTROL

Just what you have been waiting for. Electric heat treating furnaces that are easily operated; you can do your own heat treating — harden and temper dies, punches, gauges, jig and fixture parts, normalize weldings and castings. It's easy with a "LUCIFER" because it has the "LUCIFER" automatic electric heat control that permits stepless control of any predetermined heat within its range up to 2000° F. All "LUCIFER" furnaces are equipped with indicating built in pyrometers calibrated both in Fahrenheit and Centigrade, pilot light, control switches and automatic control devices. Heating elements are easily replaced after long life. "LUCIFER" furnaces are unconditionally guaranteed to give you satisfaction, and are in use by some of the leading manufacturers all over the country.

SPECIFICATIONS

- *Interior size*—Model 7051—5½"x5½"x6".
- *Exterior size*—15"x15"x17"
- *Operation*—110 V. A.C. only
- *Rating*—1.2 K. W.
- *Ship. Wt.*—Approx. 85 lbs.

Operating cost—Approx. 3c per hr.

PRICE $112.00 f.o.b. Factory, Philadelphia

SPECIFICATIONS

- *Interior size*—Model 7053—8"x8"x10"
- *Exterior size*—18"x20"x24"
- *Operation*—110 V. A.C. or 220 V. A.C.
- *Rating*—3 K. W.
- *Ship. Wt.*—Approx. 225 lbs.

Operating cost—Approx. 6 to 8c per hr.

PRICE $198.00, f.o.b. Factory, Philadelphia

SPECIFICATIONS

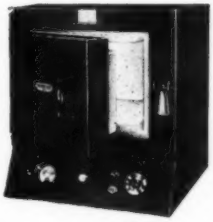
- *Interior size*—Model 7052—12"x12"x10"
- *Exterior size*—22"x22"x24"
- *Operation*—220 V. A.C.
- *Rating*—4.8 K. W.
- *Ship. Wt.*—Approx. 350 lbs.

Operating cost—Approx. 10 to 14c per hr.

PRICE $260.00, f.o.b. Factory, Philadelphia

DEALERS:

Write for our interesting offer to qualified distributors. Desirable territories open.



DISTRIBUTORS

New York—Connecticut—Northern Jersey
Lafayette Tool & Supply Co.,
128 Lafayette St., New York 13, N. Y.

Rhode Island—Massachusetts
H. Leach Machinery Co.,
387 Charles St., Providence 4, R. I.

California
Reagan Company,
6409 Santa Fe Ave., Huntington Park, Calif.

Minnesota
Satterlee Company,
118 Washington St. North,
Minneapolis 1, Minn.

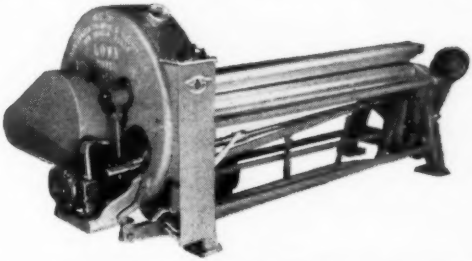
Eastern Pennsylvania—Southern New Jersey
Wilson Steel & Tool Co.,
Commercial Trust Bldg., Philadelphia 2, Pa.

SOLE SELLING AGENT . . .

GILBERT S. SIMONSKI

401 N. BROAD ST., PHILADELPHIA 8, PA.

IT'S NEW
THE LOWN
HY-PRODUCTION FORMING MACHINE



SPEED UP YOUR PRODUCTION LINE WITH THE FORMER THAT HAS EVERYTHING.

* * * *

SPECIAL FEATURES: Power adjustment on the bending roll. Dial indicator conveniently located for operator's observance when operating finger-tip controls. Power opening and closing of arm or knock-down. Initial type, but different in that you have the minimum flat place on cylinders formed due to the way rolls are positioned. Rolls are so geared that you have perfect mesh even when the feed rolls are widely separated. All three rolls motor driven.

* * * *

AVAILABLE at this time in 5" and 6" diameter rolls in lengths of 42" to 96" ranging in capacity from 3/8" to the lightest metals.

* * * *

MANUFACTURED by the SAN ANGELO FOUNDRY AND MACHINE COMPANY and brought to you through machinery dealers in all principal cities in the United States and Canada. Ask your machinery dealer or write us direct.

* * * *

SAN ANGELO FOUNDRY AND MACHINE COMPANY

San Angelo, Texas, U.S.A.

"Dealers in Principal Industrial Cities"

CUSTOM BUILT AIR CYLINDERS

Specially Designed and Built to meet your space requirements and power needs efficiently and economically.

FENN Custom-Built Air Cylinders eliminate completely the necessity of fitting your designs to standard type cylinders, particularly where space is at a premium. By adopting Fenn Cylinders you may reduce your space requirements for the same power at the same available pressure because Fenn builds them specially to meet the requisites of your designs.

Complete cylinder valve can be furnished as a separate item or as an integral part of the cylinder.

Built to provide accurate control of the piston velocity curve according to your needs, all Fenn Cylinders can be cushioned at either or both ends of the stroke.

Orders accepted in any quantity. Prices only a fraction more than standard cylinders. Inquiries invited regarding your specific problems.

The FENN Manufacturing Company

HARTFORD • CONNECTICUT

Dept. G

And Now

EMPIRE FLOATING TAP HOLDER joins the other Empire Products

ACCEPTED BY GREENLEE BROTHERS & CO. AS PROPER TOOLING FOR THEIR AUTOMATICS

The top picture shows the Empire Tap Holder in working position in a Greenlee Automatic—the lower picture shows the Floating Reamer Holder (2) along with the Luers Cutting off Blade (3)—all bring greater operating efficiencies to users.

The Floating Tap Holder is so constructed as to permit tap to float freely whether going in or out, and will not freeze under tension caused by drag of tap. No bell mouths can occur.

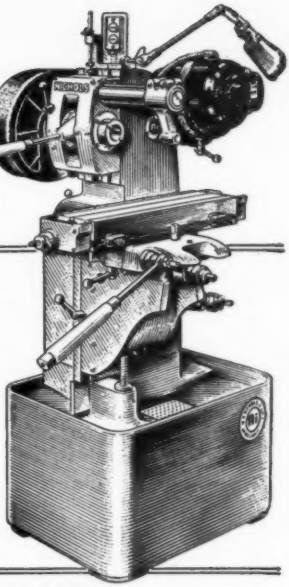
Luers Cutting-Off Blades and Holders manufactured under license issued by John Milton Luers, Patents, Inc.

PHOTOS COURTESY GREENLEE BROTHERS & CO.

EMPIRE TOOL COMPANY

8774 GRINNELL AVE. DETROIT 13, MICH.

Puts the PRECISE *in Precision*



Spindle Taper Runout: Allowable Error	.00015"
Spindle Runout on 8" Mandrel: Allowable Error	.001" F.I.R.
Parallelism of Spindle to Table: With Error at Spindle Nose	.0000"
Allowable Error 8" from Spindle Nose	—.0005"
Parallelism of Spindle to Top of Knee: Allowable Error	.001"
Right Angularity of Table to Spindle on 20" TRAM: Allowable Error	.001"
Squareness of Head Slide to Top of Knee: Allowable Error	.0005"
Parallelism of Head & Knee Slides on Column, PLANE A: Allowable Error	.0005"
Squareness of Head Slide to Top of Saddle: Allowable Error	.001"
Parallelism of Head & Knee Slides on Column, PLANE B: Allowable Error	.0005"

Every Nichols Miller is shipped with an inspection sheet showing these tolerances or better.

Everything about the Nichols Miller has been done to make it as precise as precision can be. Built-in Accuracy . . . Rigidity . . . Speed — all are there ready to give you speed with precision on a single piece or in mass quantity — with Versatility limited only by the imagination of the tool engineer or the capacity of the machine itself.

CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21" or 30"
Longitudinal Travel (screw or lever)	10" or 19"
Transverse Travel (screw or lever)	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

✓ RIGIDITY
Carefully designed, uniform-walled, box-type castings take full advantage of cast iron's strength.

✓ VERSATILITY
A "basic" machine easily tooled to handle tool room or production milling within its capacity. Mounting the work in the spindle permits Second Operation boring and facing.

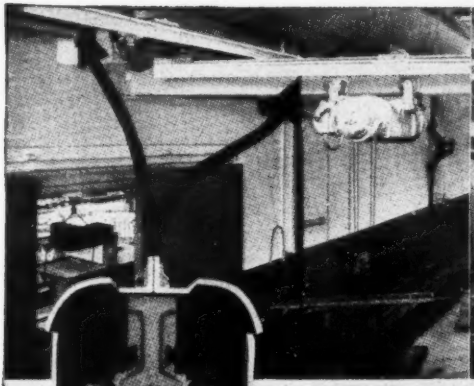
✓ SPEED
For example, the Nichols Miller can turn out 1000 cuts an hour on one setup. Then, after a quick tool change, it can be ready for another job.

Send for your free copy of "The Miller That Uses Its Head"

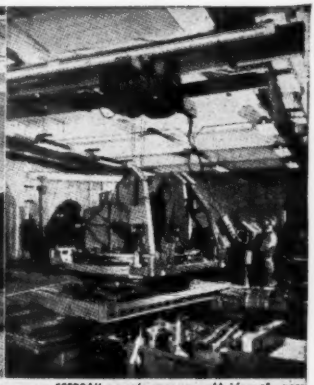
THE *Nichols* MILLER

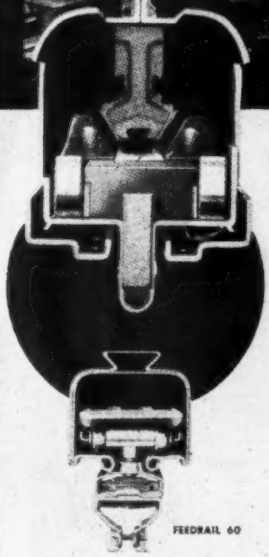
MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 42-A CHURCH ST., NEW YORK 7, N. Y.



FEEDRAIL on main runways and bridges of cranes.





FEEDRAIL 60

MODERNIZE

YOUR CRANES AND HOISTS

WITH FEEDRAIL

Exposed trolley wires have no place in a modern plant. In a day's time, you can substitute the enclosed ELECTRIC FEEDRAIL System.

It requires little space, and is furnished in assembled units in stock lengths and curves. Also available for transfers and switches to fit any desired layout.

Feedrail is mechanically strong, electrically foolproof. Trolleys are completely polarized. All electrical parts enclosed, protected against dust — accidental shorts — mechanical injuries.

AND HIGH CYCLE TOOLS

Feedrail is also designed especially for high cycle and portable tools and is used extensively for moving test racks.

Ask for

ELECTRIC FEEDRAIL
CATALOGS GENERAL No. 15
NEEDLE TRADES No. 16
MACHINE TOOL No. 17

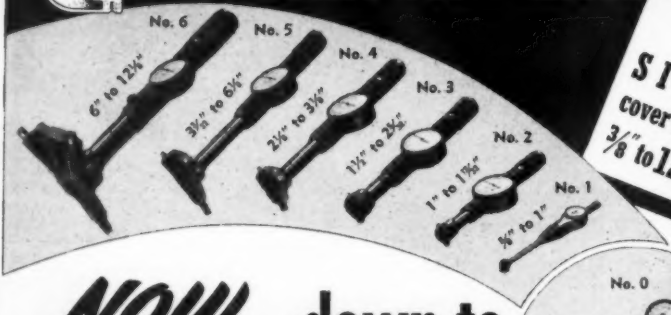
ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company

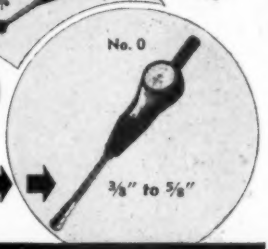
125 BARCLAY STREET • NEW YORK 7, N. Y.

STANDARD DIAL BORE GAGES

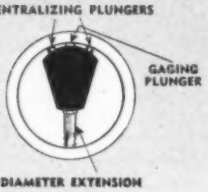


7 SIZES cover range ⅜" to 12⅛"

NOW...down to ⅜" bore ➡ ➡ ➡ ➡



STANDARD Centralizing Mechanism



Positioning method used in all types and sizes of STANDARD Dial Bore Gages. Centralizing plungers work together; keep line of measurement through center of bore at all times, whether gage is inserted at angle or not.

EASY TO OPERATE

Just insert the gage, rock it, and take the reading.

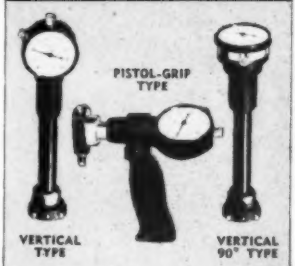
ACCURATE

Repeats consistently within 20 millionths of an inch.

PROVEN

Widely preferred among men who know precision work.

DIFFERENT TYPES
to fit different jobs. Dimensions above 1"



Special lengths available for long bores or jobs in which space in front of bore opening is limited.

Indicator graduations may be selected from the following: .001", .0005", .0001", .00005", .01 mm, .005 mm, .002 mm, .001 mm.

WRITE FOR CATALOGUE A

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

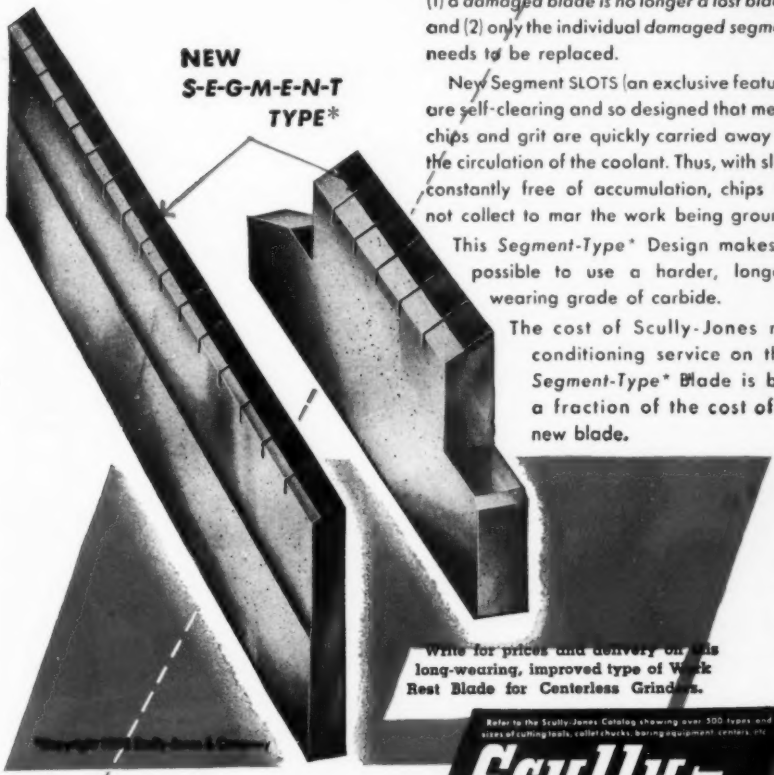
CUT THE COST OF TUNGSTEN CARBIDE-TIPPED WORK REST BLADES

NEW SCULLY-JONES *Segment-Type** WORK REST BLADES will save you money because (1) a *damaged blade is no longer a lost blade*, and (2) only the individual *damaged segment* needs to be replaced.

New Segment SLOTS (an exclusive feature) are self-clearing and so designed that metal chips and grit are quickly carried away by the circulation of the coolant. Thus, with slots constantly free of accumulation, chips do not collect to mar the work being ground.

This *Segment-Type** Design makes it possible to use a harder, longer-wearing grade of carbide.

The cost of Scully-Jones re-conditioning service on this *Segment-Type** Blade is but a fraction of the cost of a new blade.



Write for prices and delivery on this long-wearing, improved type of Work Rest Blade for Centerless Grinders.

SCULLY-JONES *SEGMENT-TYPE** T.C.T. WORK REST BLADES

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

1913 SOUTH ROCKWELL STREET · CHICAGO 8, U. S. A.

"HARDSTEEL"

DESTRUCTIVE TOOL BIT TEST

HARDSTEEL *vs.* Cast Alloy Cutting Tools

TEST LOG

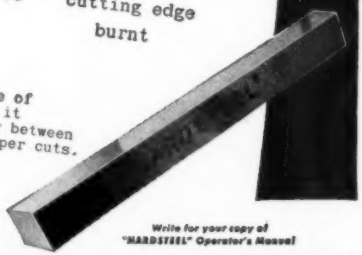
Material: Hardened and drawn High Manganese, High Carbon tool steel.
Tensile Strength: 176,000 lbs. per square inch
Rockwell Hardness: C-38 Average
Depth of Cut: .100"
Feed Per Revolution: 0035"
Surface Feet Per Minute: 130

RESULTS

	Average Total Time to Failure	Tool End Wear
"Hardsteel"	20 minutes	None
Competitor "A"	11 minutes	.008"
Competitor "B"	10 minutes	.007"
Competitor "C"	8 minutes	cutting edge burnt

Conclusion:

The inherent heat resistance of "HARDSTEEL" tool bits makes it possible to hold size longer between grinds, and take faster, deeper cuts.



BLACK DRILL CO. *Division of Black Industries*
1374 East 222nd Street • Cleveland 17, Ohio

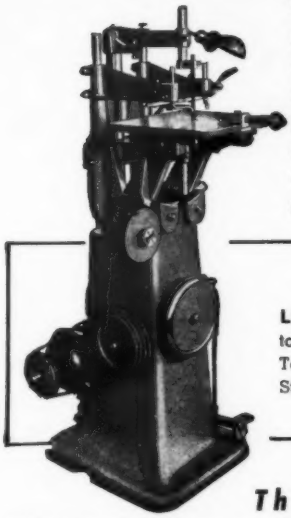
Write for your copy of "HARDSTEEL" Operator's Manual

"HARDSTEEL"

DRILLS • TOOL BITS • SPECIALS

OTHER DIVISIONS OF BLACK INDUSTRIES:
BLACK BORING AND MACHINE CO. • MEC-RAD DIVISION

OLIVER *ALL PURPOSE*
DIE MAKERS For Sawing • Filing • Tapping



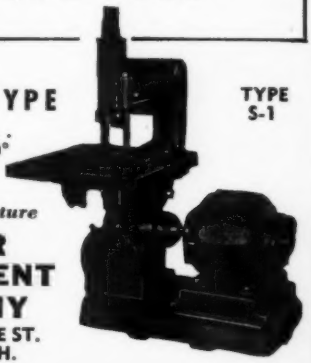
Tried and proven, the Oliver of Adrian Die Making Machine actually saves 50% to 60% on direct labor costs . . . A perfect machine for sawing, filing and lapping irregular shapes from flat metal . . . An accurate machine for making expensive dies, gages, cams, templates and stripper plates . . . Every shop should have two or more machines.

The HEAVY DUTY

LEFT—Heavy Duty . . . Saws, files, laps tool steel up to 3" thick. Permits sawing to center of 20" circle. Table 14" sq. tilts 15° to right, left and front . . . Strokes 0" to 5" with speeds from 100 to 300.

The BENCH TYPE

TYPE S-1



RIGHT—Saws, files, laps tool steel up to 1" thick . . . Saws to center of 17" circle. 10" sq. table tilts 10° right, left and forward.

Don't Neglect Your Toolroom It's the Backbone of Production!

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AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

INDEX
VERTICAL MILLS
FOR THE TOOL ROOM OR PRODUCTION LINE

For use with end mills ⅛" to 1" in steel. Equipped with verniers, as standard equipment in addition to micrometer dials on table actuating screws for locating. Further accuracy available with rods and indicators which can be furnished as extra equipment.

If you want speed and precision on milling, drilling and boring send for a catalog on Index Mills.

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A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

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KEMPSMITH
ALL-GEARED DRIVE
for POSITIVE POWER and SMOOTH MILLING

It's Chatter Free!

Precision Anti-friction Bearings Used for Spindle Mountings and All Gear Mountings . . .

For sheer ruggedness and power, you just can't beat a KEMPSMITH Milling Machine. That's because it's engineered and built for the really tough jobs. For example, KEMPSMITH has combined all-geared transmission, precision anti-friction bearing mountings and automatic splash lubrication to attain maximum transmission of positive power . . . chatter-proof smoothness in cutting . . . and long life accuracy. 13 gears permit a selection of 18 speeds and 18 feeds . . . yet there are never more than three gear contacts between clutch and cutter. The large precision-built spindle gear is always in mesh when the machine is taking heavy loads. This assures smooth, chatter-free milling, even with large diameter cutters. Consider a new, rugged KEMPSMITH the next time you need milling equipment.

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IN EXACT
CONCENTRICITY
ON ANY
SURFACE GRINDER

Designed to Hold All Straight or Taper Shank Tools from 1/16" to 1 1/2" Diameter

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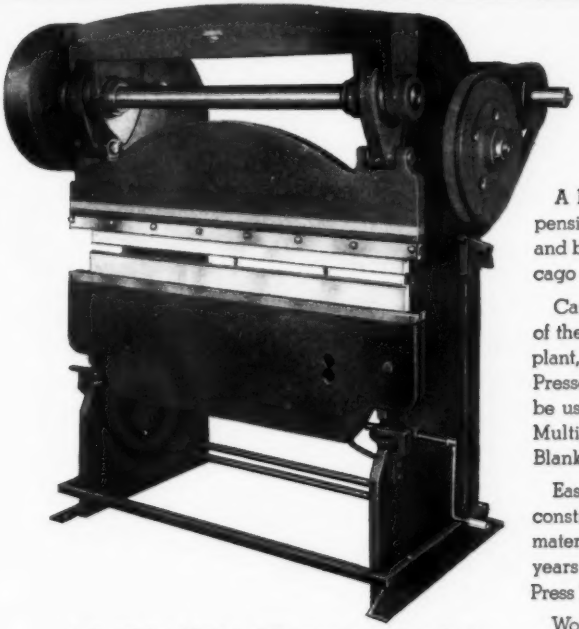
Powerful CHICAGO STEEL PRESS BRAKE



A Small Steel Welded Construction Press Brake a brute for punishment and a prodigious worker for the Sheet Metal Plant—

—3 sizes—capacities 10 gage, 4 ft. long; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by 1½ h. p. motor.

TYPE "300"

A POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

Can handle 40 to 50 percent of the work done in the average plant, thereby releasing the larger Presses for heavier work. Can be used for Forming Embossing-Multiple Punching, Notching, Blanking, etc.

Easy of operation, accurate and constructed of highest quality material and backed by over 45 years experience building Steel Press Brakes and Bending Brakes.

World's largest manufacturer of Steel Hand Bending, Power Bending and Power Press Brakes.

A dependable variable speed drive much desired by all users is standard.

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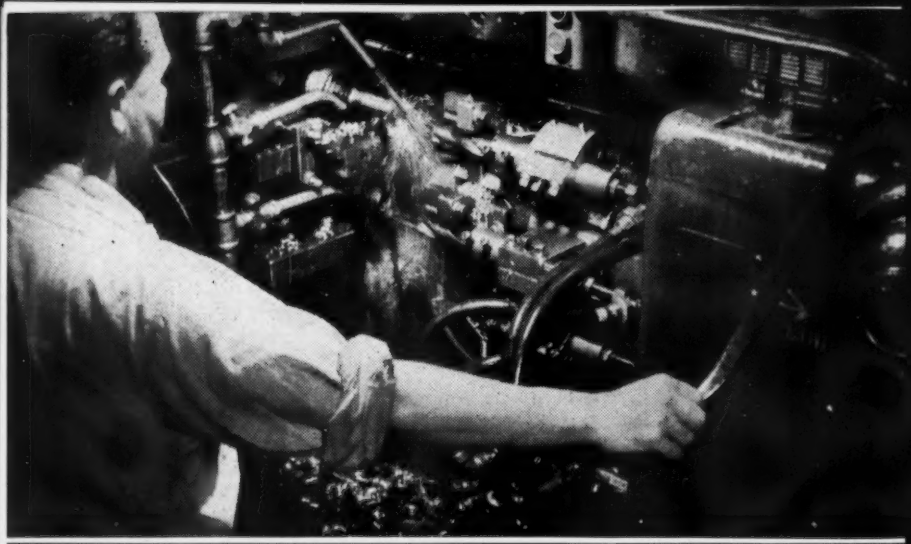

5 OPERATIONS – *33 Seconds*

SUNICUT CUTTING OIL...

Used as Machine Lubricant and Cutting Lubricant on 8-Spindle Conomatic

For exacting metal-cutting requirements, the Sun Oil Company perfected "Sunicut," a clear, free-flowing, straight, cutting lubricant, produced by an exclusive process.

Here is a typical example of the fast, accurate work which is being done in hundreds of shops with Sunicut:

Machine: Cone Automatic Machine Co. 8-spindle Conomatic
Operation: Turning (2½" Form-Tool), drilling and reaming (3⅛" depth), knurling
Material: 1335 Hot rolled bar stock
Spindle Speed: 275 R.P.M.
Cycle: 33 seconds
Feed: (drilling and reaming) .007" per revolution
Machine lubricant: Sunicut
Cutting lubricant: Sunicut

Sunicut has high lubricating value and is an excellent dispenser of heat. It makes possible heavy cuts at high speed while maintaining accuracy and finish. Call the Sun Cutting Oil Engineer in your territory for full information, or write...

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INDUSTRIAL PRODUCTS

Saw More
METAL CUTTING MACHINES

GUARANTEES THESE OUTSTANDING FEATURES

★ Sawmore machines are particularly adapted to cold cutting of bars and shapes.

★ The machine swivels on the base up to 45 degrees which makes possible both straight and angular cutting without moving or swinging stock.

★ Self-alignment of the blade is guaranteed by the exclusive Sawmore mounting of the four bearing shoes in the bearings of the saw frame.

★ The vertical saw frame slide permits straight line drive, regardless of frame position, and greater accuracy in cutting.

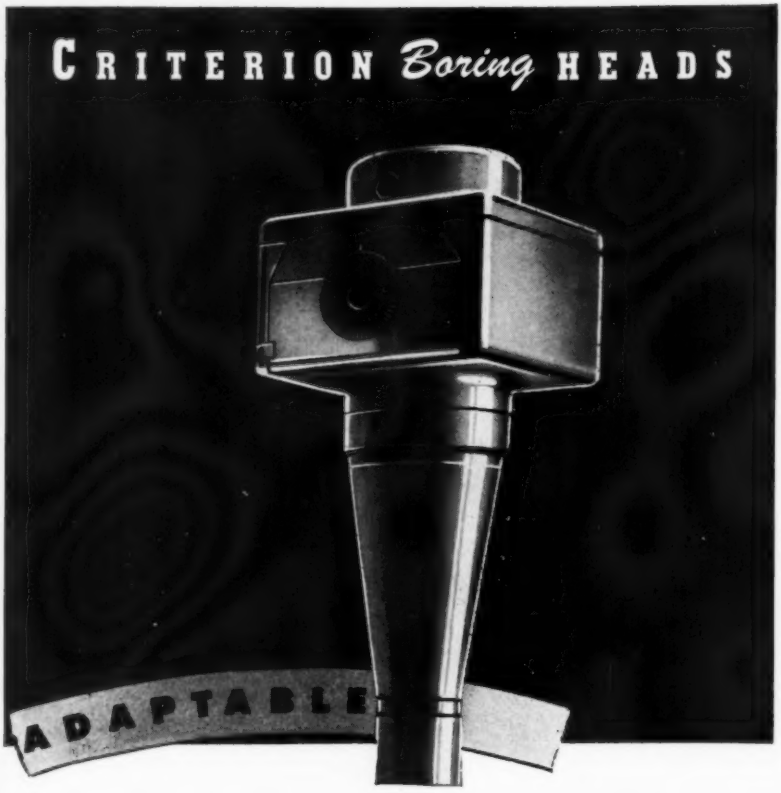
★ Stock is fed automatically up to the full capacity of the machine by a 12 foot stock carrier.

★ Spacer bar and scale accurately determine length of pieces to be cut. The spacer bar may be set for individual or multiple lengths.

Machine Size	10"x10"	6"x6"
Capacity-Straight Cutting	10"x10"	6"x6"
Capacity-45° Angle Cutting	10"x 6"	6"x4"
Blade Stroke	6"	6"
Blade Length	14"x18"	14"
Speeds	65, 93, 120, 149 S.P.M.	65, 93, 120, 149 S.P.M.
Height of Table	22"	22"
Height Over All	66"	63"
Floor Space	5'8"x3'2"	5'5"x3'7"
Size and Speed of Motor	2 H.P. 1750 r.p.m.	2 H.P. 1750 r.p.m.
Net Weight	1830 Lbs.	1670 Lbs.
Shipping Weight	2010 Lbs.	1865 Lbs.

MAQUOKETA COMPANY . . . MAQUOKETA, IOWA

CRITERION *Boring* HEADS



On Criterion Boring Heads shanks are interchangeable enabling operator to use head on different machines. Ideal for slide boring tool holder on small turret lathes. Smooth, compact, rigid. Lead Screw ground from solid AFTER hardening. Sold throughout the U.S. Order from your dealer.....

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BEVERLY HILLS, CALIFORNIA

Hydratrol Lathes

HEAVY DUTY TYPE

"THE BEST LATHE EVER MADE!"

SAYS AUSTRALIAN MFR. OF PRECISION PLASTICS

THE above photo, taken in the plant of E. W. Tilley, Melbourne, shows a 24" Heavy Duty HYDRATROL LATHE. The operator is turning dies for use in the production of Precision Plastics. A steel billet is shown, ready to go into the lathe.

In a recent letter, this concern said: "We have had lathes from all nations in use these twenty-five years, but your lathe is certainly something to be proud about.

"We have found that the design is really marvelous, and has been carried out to perfection.

"I, and all my business friends that have seen this Hydratrol Lathe working, agree that it is the best engine lathe ever manufactured."

Let us show you what a Heavy Duty HYDRATROL LATHE could do in *your* shop. Sizes 20" to 36". Also Large Hollow Spindle Type—sizes 18" to 36".

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND • SAINT LOUIS 3, MISSOURI

GAY-LEE COMPANY

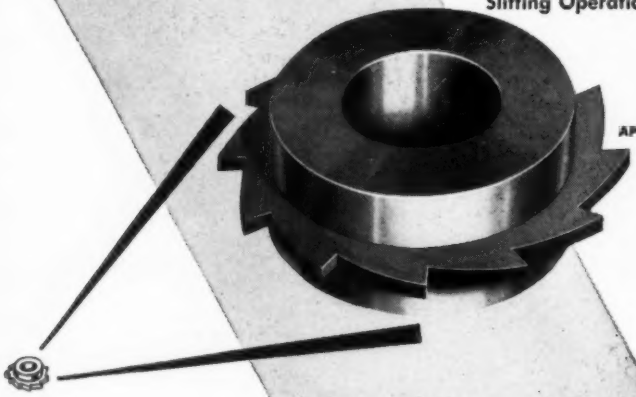
NOW—

CARBOLOY

Cemented Carbide in Hub-Type

SLITTING SAWS

for Commutators and other Slitting Operations



PATENT APPLIED FOR

A steel hub, permanently joined to a Carboloy cemented saw blade, eliminates fracturing due to the strain imposed by mounting screws or nuts. That is one reason why Gay-Lee Commutator Slitting Saws give longer service. All teeth are generated to provide extra strength, to give maximum cuts per tooth. Cutters are slightly concave to insure proper clearance. For speed and accuracy in your undercutting and "U" slotting operations, specify Gay-Lee.

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The Universal type of GEMCO Shaper, shown here, is ideal for tool and die work, or where angular setups are required. Its exclusive "Lubrigard" Safety Device increases the precision life.

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Standard shanks with Morse tapers carried in stock . . . send us your specifications and blueprints . . . we will see that your job is set up with the right LIVE CENTER.

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In shop after shop
CIRCLE "C" SUPER HIGH SPEED STEEL
licks the tough jobs!

Circle "C" is the out-and-out choice of many for maintaining peak production and limiting "down-time." Write today for full information, or ask for a convincing demonstration in your own shop.

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STEEL COMPANY

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three machines in one...

This low-cost DURO Router-Shaper-Carver can be converted from one use to another in a few seconds

An ideal machine for these quick-changing times—when the ability to shift rapidly and economically from one set-up to another is vital.

Here is an unusually flexible machine that can be used for routing, shaping and carving wood, metal or plastics. Combines high speed (20,000 R.P.M.) power (1200 watts at the spindle) and solid, heavy construction that gives smooth, vibrationless cutting. Is extremely flexible—can be transformed quickly into a Shaper or Carver. Standard equipment handles 1/4", 5/16" and 3/8" bits for routing—5/16" and 1/2" bore shaper cutters—and all standard cutters for carving. Has many special features including: Specially designed G. E. Universal Motors, New Departure Precision ball bearings, precision machining throughout; Table can be instantly adjusted to any height without holding foot pedal. Chuck is part of spindle and holds adaptor and cutter close to work, thus preventing whip. Many other exclusive features. Unusually low priced.

Send for Catalog—giving full specifications and prices on the DURO Shaper-Router-Carver—and other DURO quality Machines including Drill Presses, Circular Saws, Band Saws, Flexible Shafts, Lathes, Sanders and Electric Drills.

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MACHINE TOOL DIVISION

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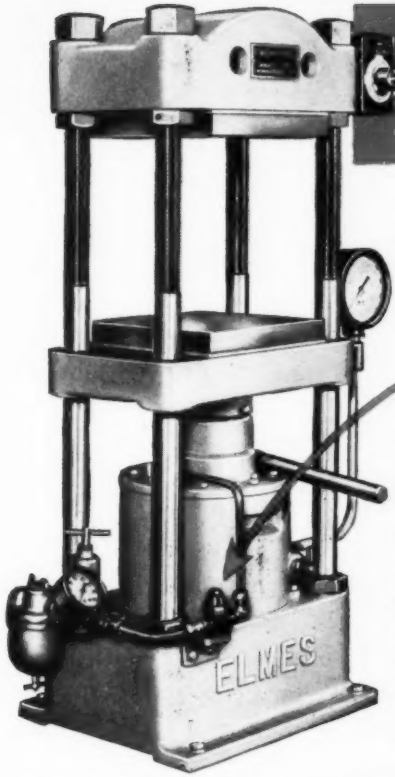
ALSO MAKERS OF DURO HAND TOOLS



Model 6441. 30-ton capacity Elmes bench-type press with effortless rapid traverse, electric hot plates, and thermostatic control. Also available in 2-column bench-type, and in floor types to 50 tons and larger.

Another Elmes "First"

Effortless Rapid Traverse

in Small-Production and Laboratory Presses

QUICK CLOSING
at the touch of this button

Here's one of the greatest advancements in small presses. Practically eliminates manual effort. Saves minutes, muscle, money. Does more in less time than ever thought possible.

New Elmes effortless quick closing gives hand operation the efficiency of *tireless* power. Shop air raises the platen instantly. Just a few strokes of the lever build up pressure. You'll say it's one of the slickest tricks you've seen.

New Bulletin No. 1035-B is ready now. It tells the whole story.

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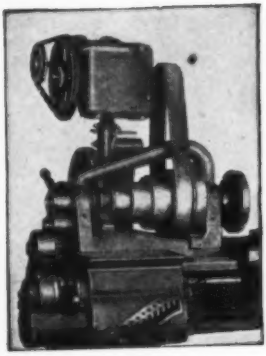

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Helps Trim Your Production Costs

From long experience in the field, Berkeley knows machine tool drive requirements. He analyzes your needs conscientiously and gives you drives engineered to enable your machine tools to deliver the maximum performance of which they are capable.

Berkeley builds drives for practically every size and type of machine tool — easy to install, low in first cost and economical to maintain.

Berkeley Drives give more flexible performance and provide the higher speed ranges generally necessary for conversion to carbide tooling.

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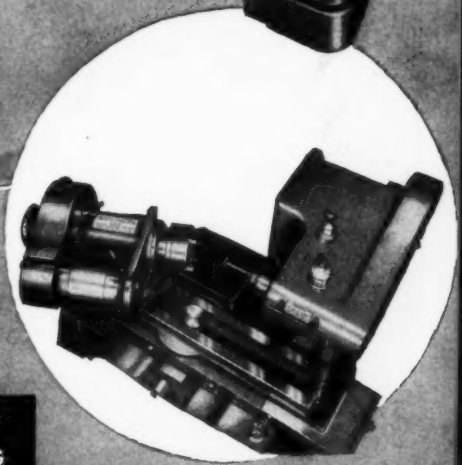
- Infinitely Variable Longitudinal Traverse
- Hydraulic Cross Feed
- Coolant
- Precision Spindles
- Heads Swivel For Angle Work
- Grinding Heads To Convert For Internal Grinding (See Cut)



EG103 SPECIFICATIONS

Work Capacity—3" Dia. x 10" Length
Workhead Accommodates—Collets 1" Max. Hole
—Chucks & Face Plates 4" Max.
Floor Space & Wt. 45" Long x 25 Wide—1600 lbs.

THE GRENBY MANUFACTURING COMPANY

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HOW TO RELOCATE AND FINISH GRIND HOLES TO .0001" IN 1/3 THE TIME

NO LONGER is it necessary for toolmakers to labor over buttons and locating plugs to correct holes in hardened parts... not if you use the Moore Jig Grinder.

You can rely entirely on this unique machine to *mechanically* relocate and finish-grind straight or tapered holes to exact size and location in 1/3 to 1/4 the time required by conventional methods.

Accurate lead screws built into the Jig Grinder enable operators to guide the work rapidly to precise location within .0001" at the turn of the micrometer dials. This eliminates hours of checking on the bench and surface plate.

Working *to figures instead of to "fit,"* the Moore Jig Grinder takes die-making out of the "one-man" class and puts it on an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die. Multi-section dies are quickly ground in *a single set-up*... eliminating separate-section hole grinding and the accompanying problems of accurately locating each section in the die bed.

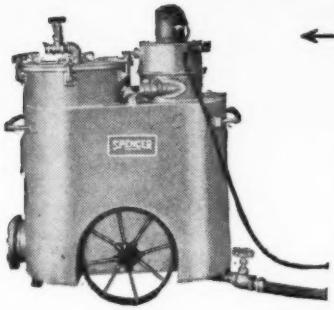
MOORE SPECIAL TOOL CO., INC.
728 UNION AVENUE, BRIDGEPORT 7, CONN.

NEW 38-PAGE CATALOG describes Moore Jig Grinder's application to dies, drill jigs, gage parts, master plates and production parts.

MOORE MAKES OF TOOLS

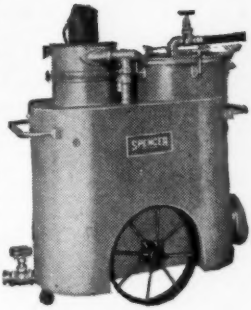
Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND



Pick-up position: Suction hose on intake at swivel connection—Two way valve open—slide valve in—three way valve open to atmosphere.

Discharge position: Pressure in tank—hose on drain valve—two way valve closed — slide valve out closing intake to vacuum producer and opening ports to allow air to be drawn into vacuum producer from outside — three way valve closed delivering air into tank under pressure.



The Spencer SUMP-VAC Cleans Sumps in 2 to 10 Minutes

A Spencer vacuum producer mounted on a closed tank on wheels removes all liquid and sludge from sump tanks in two to ten minutes compared with half an hour with former methods. The rate of pick up is 40 gallons of liquid per minute.

The tank capacity is 125 gallons or enough for 3 to 5 average sumps. A filter basket collects chips and heavy sludge. A Neoprene float valve prevents overfilling of the machine. It is emptied by gravity in two minutes. By turning the valves provided with the machine and connecting the hose to the drain valve, liquid can be discharged under approximately 3 lbs. pressure. This permits raising the liquid to a height of 6 ft., emptying the tank into a drum or other container for easy disposal.

No priming is necessary — and all material in the sump tank is cleaned out by air vacuum after the liquid is removed.

Sizes ¾ or 1½ horsepower, universal or single phase motors, 25 to 60 cycles, 110 or 220 volts or d.c.; 12½ foot vacuum hose lengths and 50 foot cable extension. Ask for the bulletin.

SPENCER HARTFORD VACUUM CLEANING

THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

finer finishes

faster speeds

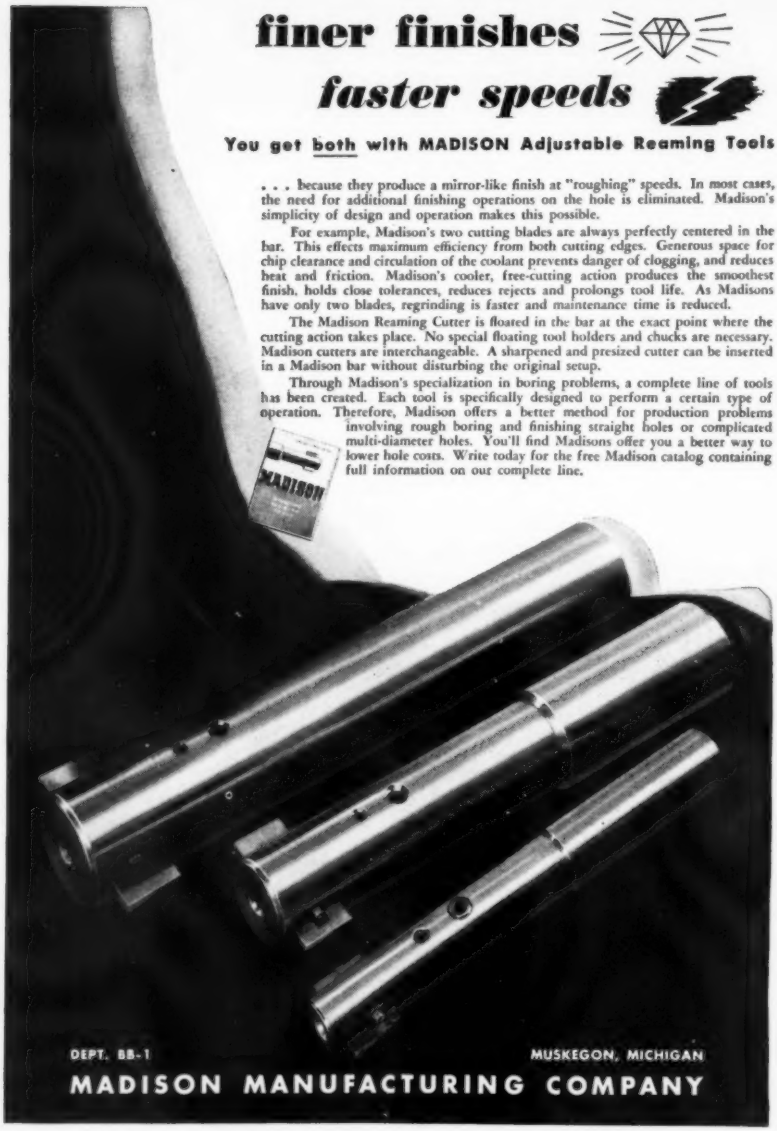
You get both with MADISON Adjustable Reaming Tools

. . . because they produce a mirror-like finish at "roughing" speeds. In most cases, the need for additional finishing operations on the hole is eliminated. Madison's simplicity of design and operation makes this possible.

For example, Madison's two cutting blades are always perfectly centered in the bar. This effects maximum efficiency from both cutting edges. Generous space for chip clearance and circulation of the coolant prevents danger of clogging, and reduces heat and friction. Madison's cooler, free-cutting action produces the smoothest finish, holds close tolerances, reduces rejects and prolongs tool life. As Madisons have only two blades, regrinding is faster and maintenance time is reduced.

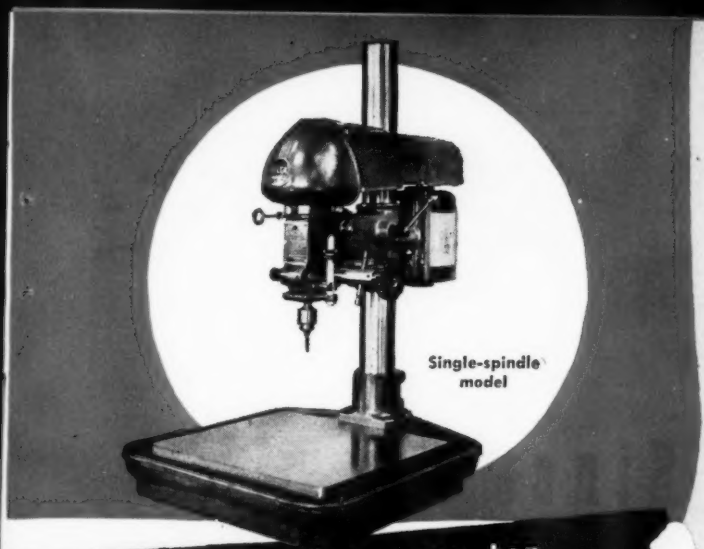
The Madison Reaming Cutter is floated in the bar at the exact point where the cutting action takes place. No special floating tool holders and chucks are necessary. Madison cutters are interchangeable. A sharpened and presized cutter can be inserted in a Madison bar without disturbing the original setup.

Through Madison's specialization in boring problems, a complete line of tools has been created. Each tool is specifically designed to perform a certain type of operation. Therefore, Madison offers a better method for production problems involving rough boring and finishing straight holes or complicated multi-diameter holes. You'll find Madisons offer you a better way to lower hole costs. Write today for the free Madison catalog containing full information on our complete line.



DEPT. BB-1 MUSKEGON, MICHIGAN

MADISON MANUFACTURING COMPANY



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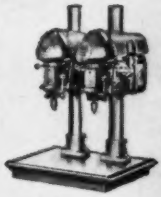
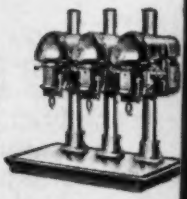
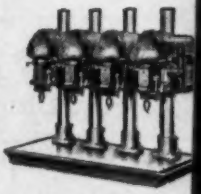

2-spindle model


3-spindle model


4-spindle model

A low-cost tool for greater accuracy on sensitive drilling from .025" to 1/4" diameter . . .

Delta-Milwaukee Super-Hi-Speed* Drill Press

All the well-known operating advantages of other Delta-Milwaukee drill presses, in a high-speed machine for small-hole drilling of plastics, aluminum, and other metals. Drills to the center of a 14" circle.

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Since 1903

Strand Flexible Shaft Machines have answered the call for portable, rotary power with efficiently designed, solidly constructed flexible shaft machines that insure constant speeds with dependability and greater operator convenience.

If your job calls for grinding, polishing, buffing, sanding, drilling, reaming, screw-driving or nut-setting—especially in out-of-the-way places, a Strand machine will do it faster, better, and stand up to it longer. Hundreds of attachments can be easily interchanged. 125 types and sizes. Models include vertical and horizontal type machines from ⅛ to 3 H.P. Distributors in all principal cities.

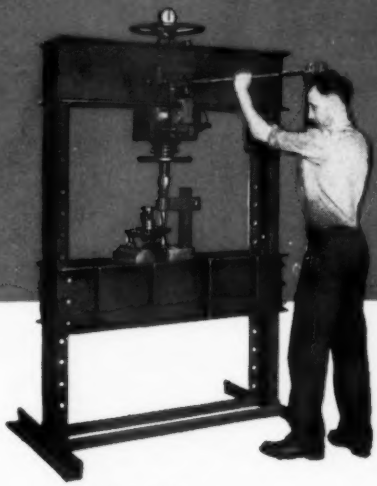
Send today for 112 page catalog showing complete line.

Type M5

Strand
FLEXIBLE SHAFTS

N. A. STRAND & CO.
5016 NO. WOLCOTT AVE. CHICAGO 40, ILL.

Garages
Tool Rooms
Maintenance
Shops



ACCESSORIES

No. 1-RF Ring Gear Riveting Attachment. Upsets rivets cold so holes are completely filled.

No. 35-20 Dial Test Indicator with Bracket and Arm for accurate testing during straightening. Sensitive to .001 inch.

No. 38-25 Testing Attachment. Supports work up to 64 inches long for straightness tests with the Dial Test Indicator.

—need this DEPENDABLE PRESS

Here's a sturdy, easy-to-use arbor press that meets the needs of most shops. Available in 50- and 70-ton capacities, it is widely used for removal and replacement of press-fit parts as well as for general bending and straightening.

All Dake presses are built with massive frames to handle extreme pressures safely. The hydraulic workhead is a trouble-free, self-contained unit that can be moved to any point along the top channels. The screw-type ram can be advanced quickly to speed operation.

Send the coupon below for full information on this and many other useful Dake presses.

• Dake Engine Company
608 Seventh St.,
Grand Haven, Michigan

Please mail me a copy of the latest Dake Arbor Press Catalog.

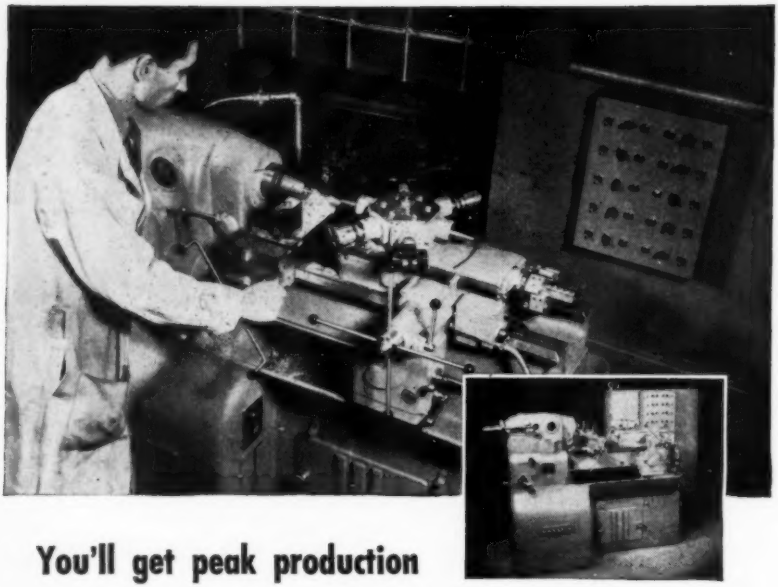
Name_____

Title_____

Company_____

Address_____

DAKE
ENGINE COMPANY
GRAND HAVEN, MICHIGAN



You'll get peak production AT A PROFIT—with the *Speed-Matic**

Automatic electronic speed change, preselected for as many as ten stations. Complete range of spindle speeds—50 to 5000 RPM. Feeds from .0005" to .016" per revolution. Collet chuck capacity 7/8".

You can define the Speed-Matic's specifications with those facts—but you can't describe its production capacity till you've seen it *in operation*. Finished parts roll off like peas shucked from a pod—and with unsurpassed accuracy. We think you'll call it *The World's Fastest Hand Screw Machine.*

In the Speed-Matic maximum high production is combined with extreme accuracy, on lots of 25 to 500 or higher. Power feed, ram-type turret is teamed with a spring-return, hand-operated, cut-off slide.

***SPEED-MATIC**—Add this new name to your metal-turning dictionary—you'll be hearing a lot of it—wherever rising production costs are a factor. The *Speed-Matic* is Monarch's answer to this problem in the hand screw machine field. Get full details *now*—from your nearest Monarch representative—or write us direct.

The Monarch Machine Tool Co.
Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

A "WAR VETERAN"

with a distinguished Service Record

Long before Pearl Harbor, the Dremel MOTO-TOOL won its spurs by the way it tackled tough jobs in tool rooms and machine shops, and on production lines. But when American industry swung its full strength into war production and our armed forces established far flung assembly and repair bases the already healthy demand for these mighty little midgets quadrupled.

Operators of Moto-Tools are ever discovering new jobs . . . new ways to save time and cut costs . . . with these pocket size machine shops. Girls quickly become proficient with them because a Moto-Tool weighs but 13 ounces, is shaped to fit the hand, has a balanced armature to prevent vibration. Thousands of Moto-Tools helped make the atomic bomb . . . were used to establish production records in plants such as General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Northrup, Douglas, and many others.

A FEW OF THE MANY JOBS THAT CAN BE DONE BETTER AND FASTER with MOTO-TOOL

☐ Sharpening	☐ Burring	☐ Cleaning
☐ Finishing	☐ Grinding	☐ Routing
☐ Touching Up	☐ Polishing	☐ Cutting
☐ Sanding	☐ Burnishing	☐ Rasping
☐ Drilling	☐ Inlaying	☐ Carving
☐ Mortising	☐ Sawing	☐ Brushing
☐ Engraving	☐ Scoring	☐ Dressing

Model 2 Moto - Tool, complete with 23 accessories, in felt-lined hard wood case . . . $23.50. Model 2 Moto - Tool only, with one emery wheel point . . . $16.50.

Model 2 Moto-Tool develops 27,000 rpm . . . the proper speed for clean, smooth, accurate work, and long life from points and cutters. It is sturdily built throughout and has a shock-proof bakelite housing and oil-less (oil sealed) bearings. Uses 110-120 volt AC or DC current. Patented automatic chuck lock pin makes removal of accessories easy. Pin disengages automatically . . . prevents accidental burning out of motor. Ask your Mill Supply salesman about Dremel Moto-Tools and accessories. If his firm does not carry them, write factory or nearest Dremel representative.

DREMEL MANUFACTURING CO.
Dept. 216-F **Racine, Wis.**

Federated Sales
2437 W Valley
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Mill Factor Products
53 W. Broadway
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F. W. Fowler
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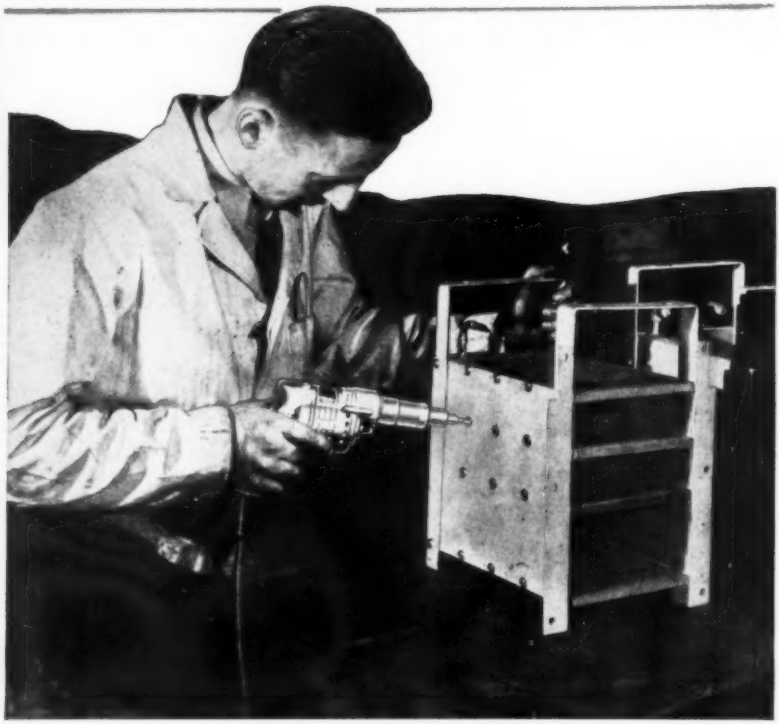
J. J. Backer
2321 Second Ave.
Seattle, Wash.

"More than Human"



Thor U16CP (Shown above driving screws on a refrigerator unit)

All Screw driving problems solved here!

A wide range of straight, angle and extension attachments speed assembly—whatever the size, type, location or tightness requirements of your screwdriving or nut setting jobs. In fact, Thor engineers have never failed to solve any screw or nut driving problem yet presented. They'll be glad to check on yours . . . without obligation to you.

in their { ACCURACY / EFFICIENCY / SPEED

Thor

PORTABLE ELECTRIC

SCREW DRIVERS and NUT SETTERS

You'll "put it together". . . faster with these versatile assembly tools

"UNCANNY" is the way operators describe the unfailing accuracy with which Thor portable electric assembly tools drive screws and set nuts to uniform tightness at top speed. But, it is understandable when you know the precision-built control features in these Thor tools.

An adjustable clutch, for example, standard on most models, permits driving each fastener precisely to a pre-set tension. Power is positively controlled, too, by precision-wound motors and precision-cut gearing so that you get exactly the right combination of speed and torque for the job.

If you want to "put it together" three or four times faster—write, or call your nearest Thor distributor.

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Thor **PORTABLE POWER TOOLS**

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

Long-Life ACCURACY

Marveco Live Center—designed and constructed for **long wear** and **unusual capacity.** Automatic takeup compensates for wear quaranteeing Long Life Accuracy.

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THE LIVE CENTER

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WITH A GUARANTEE

Send today for Free Catalog "THE MARVELS OF MARVECO"

MARVEL TOOL & MACHINE COMPANY

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COLOR-TALKING PICTURE:

"HACKSAWS AND HOW TO USE THEM"

SEE what actually happens in a hacksaw cut! SEE . . . *and show your men* . . . how to choose and use the proper Hand or Power Hacksaw Blade for any type of cutting. This 16 mm Simonds film shows how to get top performance from the top Hacksaw Blades . . . Simonds "Red End" Blades . . . made in 3 types of special steel from Simonds Steel Mills. For a showing of this film, ask your Industrial Supply Distributor or the nearest Simonds office.

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with

CARTER *Guide-Line* LIGHTS

— *Brilliant* **WHITE** *Lights that throw a* **SHARP, BLACK** ***Shadow*** **GUIDE-LINE**

For Use On:

- Rip Saws
- Tandem Saws
- Double-End Tenoners
- Veneer Matching Tables

With increased labor and material costs, Modernization of productive operations is the key to low-cost output. Carter Guide-Line Lights with tilting attachment enable you to increase and improve your productive output on cutting operations by providing a shadow Guide-Line which just shaves the stock to be cut.

Write today for FREE complete information on this modern, tested, time-saving equipment.

CARTER PRODUCTS COMPANY

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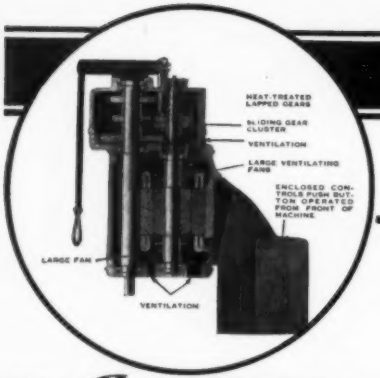
DESIGNED to eliminate the costly procedure of setting up the dies every time a job is repeated. "Standard" All-Steel Die Sets decrease set up time and lengthen tool life.

BUILT for the same long—productive service as the universally used "Standard" Power Presses.

Set up your dies only once—the first time—in a "Standard" All-Steel Die Set. Then they'll be ready every time the job is repeated. Used with any make of press—sizes to fit your needs. Prompt shipment offered on all catalog sizes. Write for catalog.

STANDARD MACHINERY CO.
1555 Elmwood Ave., Providence 7, R. I., U. S. A.

Avey FEATURE No. 2



THE Avey TYPE MA-6

AVEY-MATIC POWER FED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

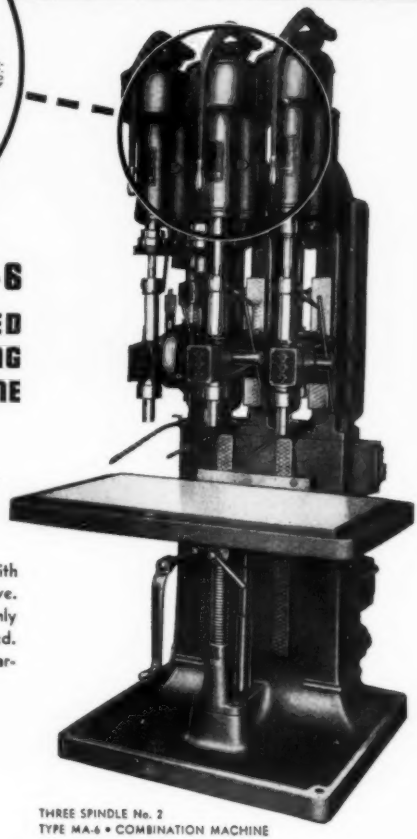
features

motor and gear box construction of six speed machine

Motor mounted directly back of spindle with gearing between motor and spindle drive sleeve. Two speed motor, three speed transmission. Only one pair of gears in mesh at any spindle speed. Motor and spindle drive mounted on ball bearings, fan ventilated motor.

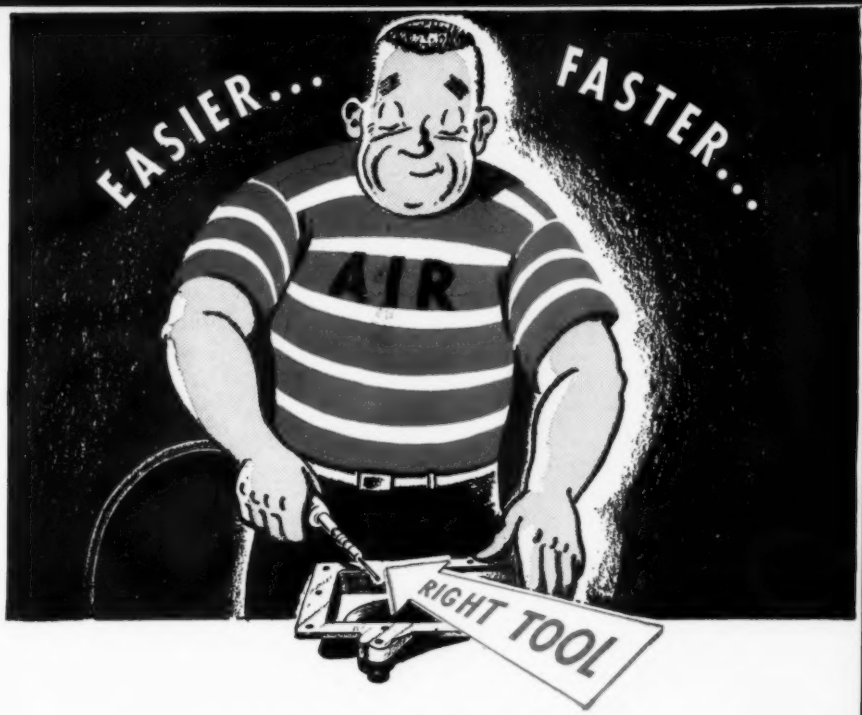
Type MA-6 is made in following capacities:
No. 2 — 7/8" capacity in cast iron.
No. 3 — 1¼" capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

Avey



CUTS COST 50%

HAND files and scrapers were being used by this manufacturer of railroad equipment for filing sharp machine edges and burrs on bronze castings. The Rotor Application Engineer suggested doing it the easy way with a Rotor M-827 midget grinder with rotary file. This 20,000 R.P.M., 1¼ lb. Rotor air tool was installed and gave these results:

50% reduction in burring costs because high-speed, light-weight Rotor midget file doubles production compared to former hand operation.

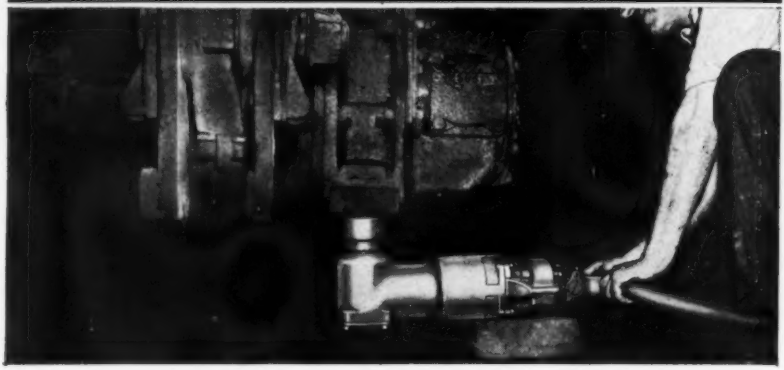
A more uniform, smoother finish because this rotary power file is easy to handle and reaches places inaccessible with hand files.

Perhaps you have hand filing operations which could be done quicker and better with these high-speed, light-weight tools. Let the Rotor Application Engineer suggest ways to decrease your costs by increasing your output per man per dollar.

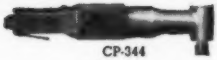
Yours for smoother filing,
AIR O'TOOL

THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

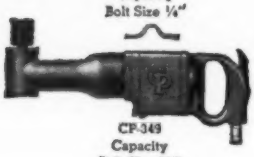
For Work in Close Quarters



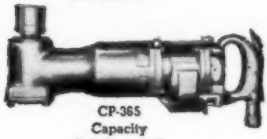
CP-337
Capacity
Bolt Size ¼"



CP-344
Capacity
Bolt Size ⅜"



CP-349
Capacity
Bolt Size ½"



CP-365
Capacity
Bolt Size 1¼"

CP Pneumatic Angle Wrenches are big time-savers

Chicago Pneumatic offers the world's largest line of Pneumatic Wrenches (Impact Type). It is the only manufacturer of angle-type Pneumatic Wrenches for applying or removing nuts, bolts and studs in hard-to-reach locations. Models 337 and 344 are also furnished with 45 degree angle heads for the extra hard places to reach. CP Pneumatic Wrenches (Impact Type) run on or back off nuts, bolts and studs in a fraction of the time required by hand wrenches. Write today for complete information.

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General Offices: 8 East 44th Street, New York 17, N. Y.

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AIR COMPRESSORS
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AVIATION ACCESSORIES

Conner MULTI-TIP DRILLS

Save TIME

Cut COSTS

LARGE DIAMETER SPADE DRILLS FROM STOCK

• DEEP HOLE DRILLS •

FORM DRILLS • OIL HOLE DRILLS

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Note—Drill large holes from the solid. No lead drill necessary!

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TOOL & CUTTER CO.

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DETROIT 13, MICH.

"WE GET SMOOTHER—TRUE HOLES FIVE TIMES AS FAST—

With the Sunnen Precision Honing Machine"

—CHANDLER MACHINE CO.

Hardened steel parts, bearings, connecting links, and other parts going into their sewing machines have been honed for several years at the Chandler Machine Company of Ayer, Mass.

Tolerance is held within .00025" with a very smooth mirror finish on the honed surface. Previous to using Sunnen honing, these parts were lapped — and copper laps were constantly wearing out, leaving bell-shaped holes. In addition to spoiling materials, lapping was costing them a great amount of unnecessary production time.

Now, the Sunnen Precision Honing Machine is giving them smoother finishes in more accurate holes — *at least* five times as fast.

If you have an internal finishing problem on which you need greater accuracy — or more speed — or a smoother finish, ask a Sunnen engineer to call, or write for a free bulletin giving complete details of Sunnen Honing.

SUNNEN

SUNNEN PRODUCTS COMPANY

7935 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

Typical Jobs

Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

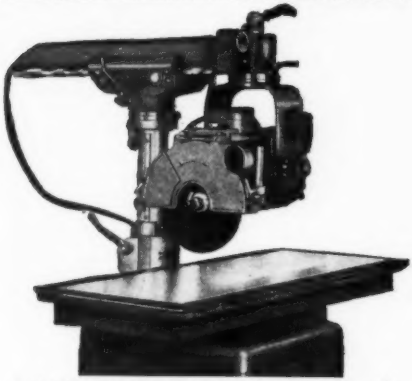
Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .0002[illegible]"

WALKER-TURNER MACHINE TOOLS
cut Production Costs . . . 4 WAYS!



W-T RADIAL CUT-OFF MACHINE—Cuts at any angle. Ram travels 21½".

W-T RADIAL DRILL—Speed range 110-8300 R.P.M.

(1) LOW FIRST COST

W-T low prices are a direct result of sound engineering, manufacturing know-how and volume production.

(2) LOW OPERATING COST

Compact, rugged construction, elimination of unessential weight, keep power and maintenance costs low.

(3) WIDE SPEED RANGES

Selection of correct cutting speed for each material provides maximum cutting efficiency.

(4) MULTI-PURPOSE DESIGN

Adaptable to a wide variety of operations — in standard or special setups — in single or multiple installations — solving troublesome tooling problems at low cost.

WALKER-TURNER COMPANY
PLAINFIELD, N. J.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Now

A TOOL HOLDER WITH VERTICAL ADJUSTMENT

..FOR USING BORING TOOLS IN LATHES

A simple, quick turn of a knurled screw moves tool in vertical plane for precision setting. Use of shims is eliminated. Positive locking device.

Screw has Acme thread, hardened and ground. All parts made of alloy steel, heat treated.

Send for Catalog H464

TWO SIZES: BT-1—½x1¼"
BT-0—⅜x1"

TRADE MARK REG. U. S. PAT. OFF.

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

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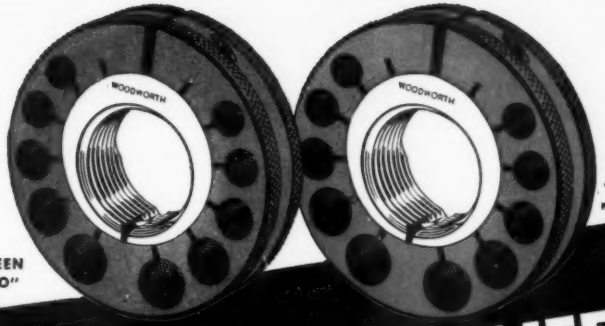


NOW! GAGE LIFE 12½ TIMES LONGER ...SERVICE RECORDS SHOW

5-PLUS FEATURES

1. Greater accuracy and stability
2. Longer wear life
3. Less weight
4. Positive identification
5. Positive adjustment

ACCURACY YOU CAN TRUST

WOODWORTH THREAD RING GAGE PROVES AMAZING SUPREMACY OVER ORDINARY GAGES

Almost unbelievable results on actual shop inspection prove the new Woodworth Adjustable Thread Ring Gage far superior to ring gages of ordinary design.

ONE MANUFACTURER, USER OF MANY GAGES, MAINTAINED ACCURATE INSPECTION WITH A SINGLE WOODWORTH GAGE TWELVE AND ONE-HALF TIMES LONGER THAN WITH ANY RING GAGE PREVIOUSLY USED. THINK WHAT THIS MEANS TO YOUR GAGE COSTS.

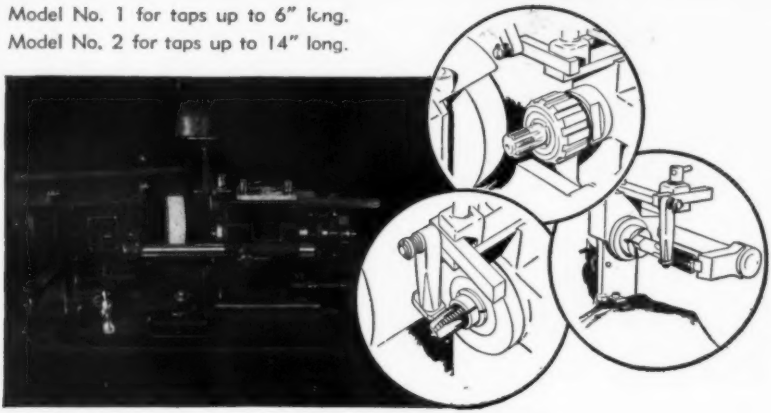
Wire or write for folder No. 46R.

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINED PARTS • DIAPHRAGM CHUCKS • ADJUSTABLE CLAMPING JIGS • SPECIAL TOOLS

Model No. 1 for taps up to 6" long.
Model No. 2 for taps up to 14" long.



Put Your TAP SHARPENING On a PRODUCTION BASIS . . . with the BLAKE TAP GRINDER

The Blake Tap Grinder—like your production machines which you have chosen carefully and wisely—will give you the maximum returns on your investment of man-hours and money.

Every operation necessary for the **accurate** chamfer sharpening of taps has been reduced to take the least possible amount of time. Some of these "production-sharpening" features of the Blake are:

- Taps may be inserted or removed in a few seconds.
- It's easy to change from size to size.
- You can sharpen right-hand or left-hand taps **without any change** in the machine.
- You can sharpen a wide variety of taps, with 2, 3, 4, 5, 6, 8 or 10 flutes. (Also sharpen countersinks, the lead on reamers, 3- and 4-flute drills, step drills, and many other tools requiring relief on the point.)
- It has a special adjustable eccentric mechanism which allows **both** the chamfer angle and the relief—**of all the lands**—to be ground in **one continuous operation.**

You can't afford to risk having your production machines idle because of a lack of sharp, accurately ground taps. Mail the coupon today for complete details.

No machine is better than the cutting edge of the tool it uses.

Please send me bulletin 544 which gives complete details on Blake Tap Grinders.

H.

NAME_____ TITLE_____

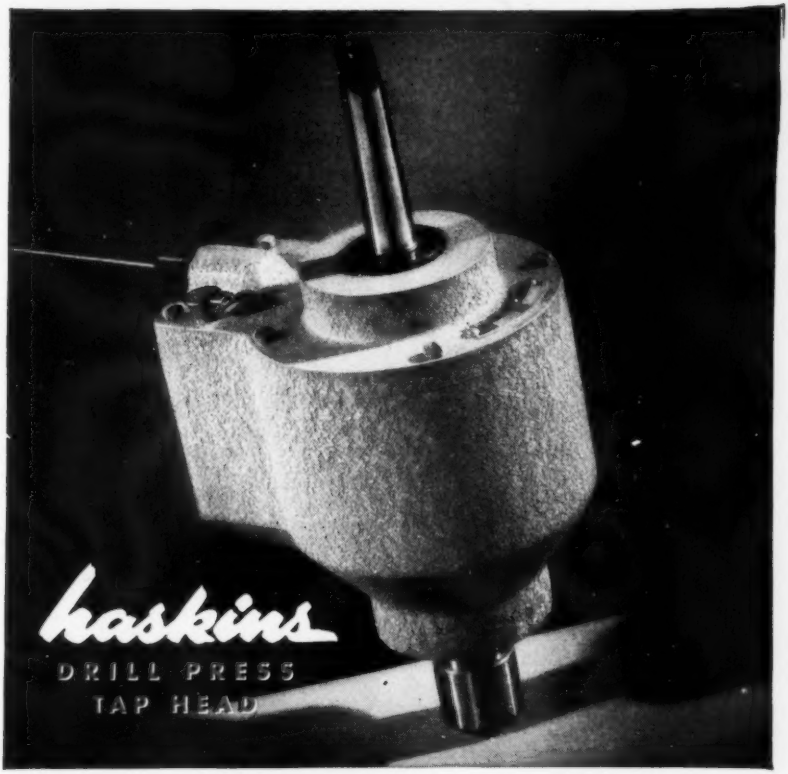
COMPANY_____

STREET_____

CITY_____ STATE_____

EDWARD BLAKE CO.
634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS—HAGER CARBIDE TOOL GRINDERS



The same quality tap head which Haskins features in its high-speed Electric-Air controlled tapping machine. It easily fits your own drill press to provide more economical production, greater tapping accuracy, longer trouble-free operation. Send for catalog D.

- PRECISION CONSTRUCTION
- BALL BEARINGS THROUGHOUT
- DOUBLE CONE FRICTION CLUTCH
- DOUBLE SPEED REVERSE
- COUNTERBALANCED SPINDLE
- ALUMINUM HOUSING
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- NON-GLARE CRYSTAL FINISH
- IMMEDIATE DELIVERY
- STURDY, VIBRATION-FREE
- LUG TYPE SPINDLE AVAILABLE FOR EXTERNAL THREADING WITH ACORN DIES

R. G. HASKINS CO. • 624 S. California Ave. • Chicago 12

HASKINS haskins PRECISION TAPPING EQUIPMENT

New Axial Relief GRINDING FIXTURE

TAKES THE PLACE OF COSTLY SPECIAL DUTY GRINDING MACHINES

A FIXTURE especially adapted to grinding cutting edges, steps, flutes and chip relief on milling cutters, burring tools, counterbores, countersinks, end mills, reamers, drills and taps.

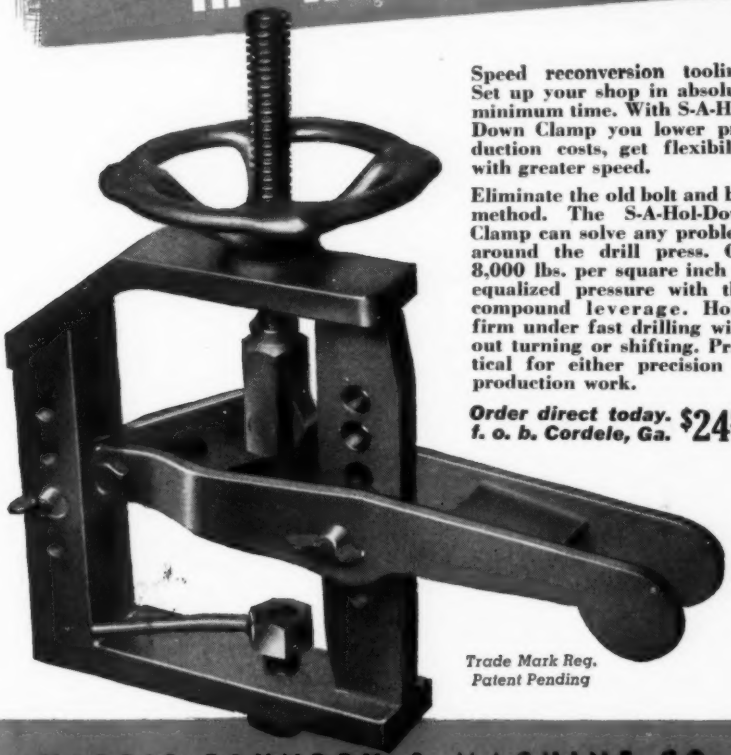
All adjustments simple, visual and external. Instantly adjusted to right or left hand. Automatic indexing equalized at all turns. Can be used on surface grinders as well as cutter grinders. Performs most jobs with standard grinding wheels.

Send for literature explaining simplicity of operation and illustrating a number of typical applications.

WRITE FOR Literature

GOVRO-NELSON CO.
1933 Antoinette
Detroit 8, Mich.

S-A-Hol-Down Clamp Secures Work Pieces in Record Time!



Speed reconversion tooling. Set up your shop in absolute minimum time. With S-A-Hol-Down Clamp you lower production costs, get flexibility with greater speed.

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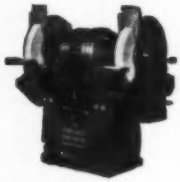

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Heavy Duty
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1896 TO 1946

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Since 1896 machine tool manufacturers have made outstanding advancements in methods of manufacture.

During this period Hisey-Wolf has not only kept abreast of the trend, but in many instances has pioneered developments in the manufacture of grinders and buffers.

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Snagging
Grinder

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A real precision tool that assures accurate turning. Has precision bearings—both, ball bearings for radial load, tapered roller bearings for thrust load.

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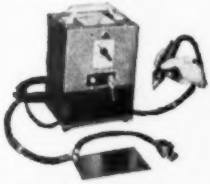

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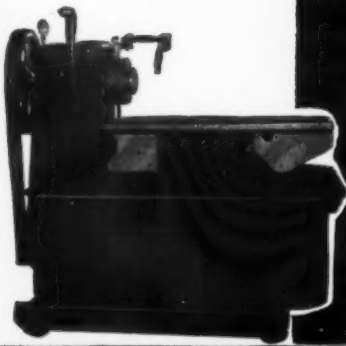

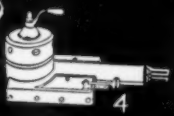

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2 CROSS SLIDE: Rack and pinion feed.

3 CARRIAGE: With manual or power feed, 3 lengths to 18"

4 TURRET: 6 station flat type, with hand or power feed.

Many other standard or special attachments available—also any type drive.

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Do ceiling prices and high labor costs make your production costs a problem? You can save on both first cost and operating cost with the Minneapolis Production Lathe, which is easily handled by inexperienced help. Under our plan, you order only the equipment needed for your particular job. 14" swing, heavy duty spindle assembly. 2¼" round bar capacity. Send sample part of drawing, and we'll quote you on a Minneapolis lathe "tailor made" for your work.

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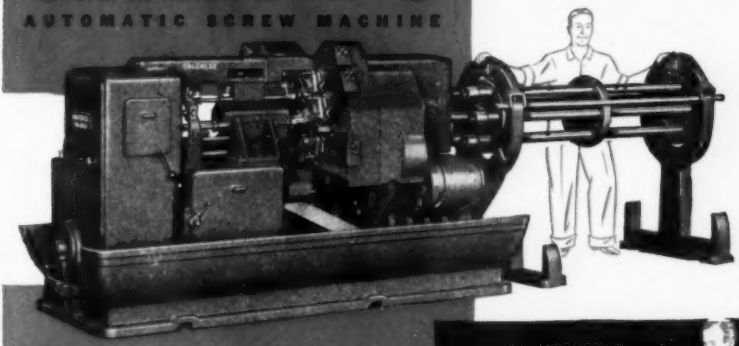
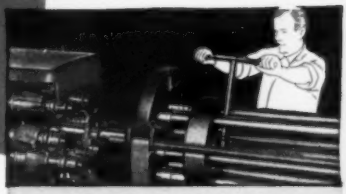
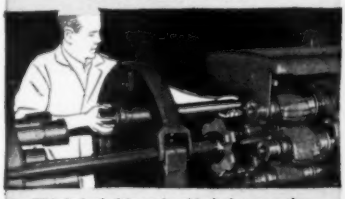
STOCK-FEED FEATURES OF THE GREENLEE "6" AUTOMATIC SCREW MACHINE



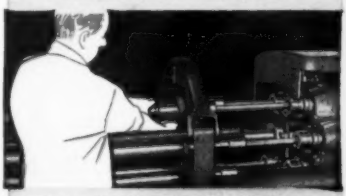
PUSHER TUBES, FEED TUBES, and STOCK REEL DESIGNED for EFFICIENCY



This picture illustrates the method of using the wrench to move the head of the stock reel.



With the head of the stock reel back, the operator has plenty of room to change stock pusher tubes.



This shows the quick hand-release for stock reel tubes—an exclusive Greenlee efficiency feature.

EASY TO GET AT. Quick access to all parts of the stock-feeding mechanism is a distinctive feature of the GREENLEE "6" Any of the six ball-bearing tubes in the stock reel can be released instantly by hand to provide more room for the operator to handle stock while reloading the spindles.

EASY TO CHANGE OVER. When a new set-up calls for a change in stock size, a few turns on a wrench moves the head of the stock reel backward. This affords the operator plenty of room to change the stock pusher tube assemblies after releasing and indexing the retainer plate.

OTHER FEATURES OF THE MACHINE. The GREENLEE "6" has many other advantages which makes it a highly efficient, versatile, accurate, and productive machine. Send for our 20-page brochure "Greenlee Automatic Screw Machine" that shows and describes every outstanding feature. Learn why the GREENLEE "6" is often called "The Operator's Favorite"

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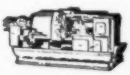
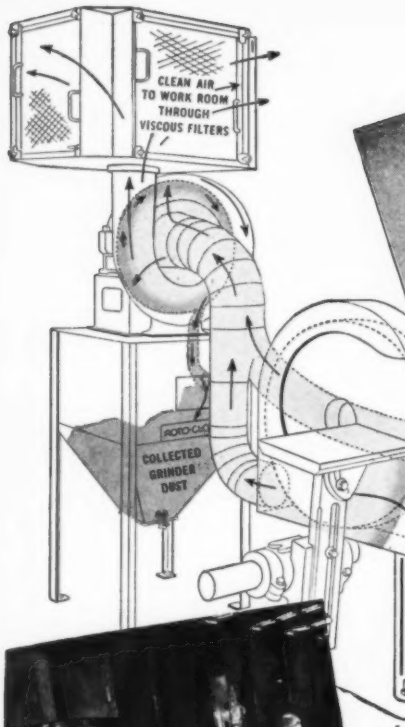


MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



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FOR ALL GRINDING OPERATIONS

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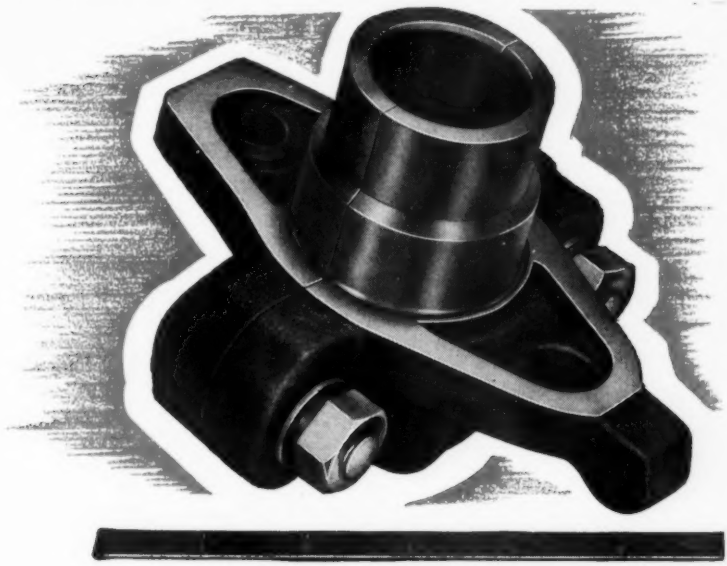

A case of machining a complete sub-assembly

Illustrated above is a malleable iron hub used in textile machinery. The two halves bolted together as shown are loaded exactly like a single piece, and our Model 16 Six Spindle Automatic Chucking Machine performs the facing, turning, chamfering and undercutting operations with a substantial saving of time and cost.

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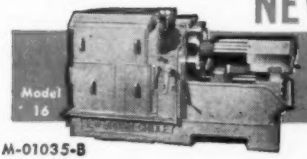

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for Better Productivity

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The Hendey Machine Company

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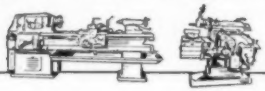

TOOL ROOM LATHES
12"-14"-16"-18"-20"-24"

SHAPERS
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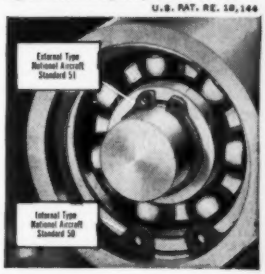

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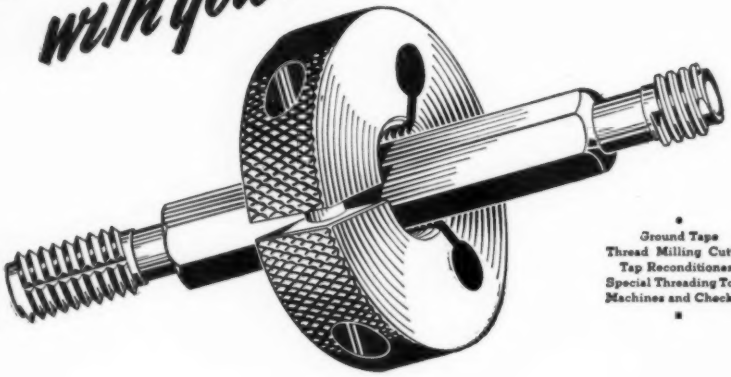
CANADIAN REPRESENTATIVE: ARCWOOD PRODUCTS AND ENGINEERING CORPORATION, LTD., 72-74 STAFFORD STREET, TORONTO

Don't get caught with your tolerances down



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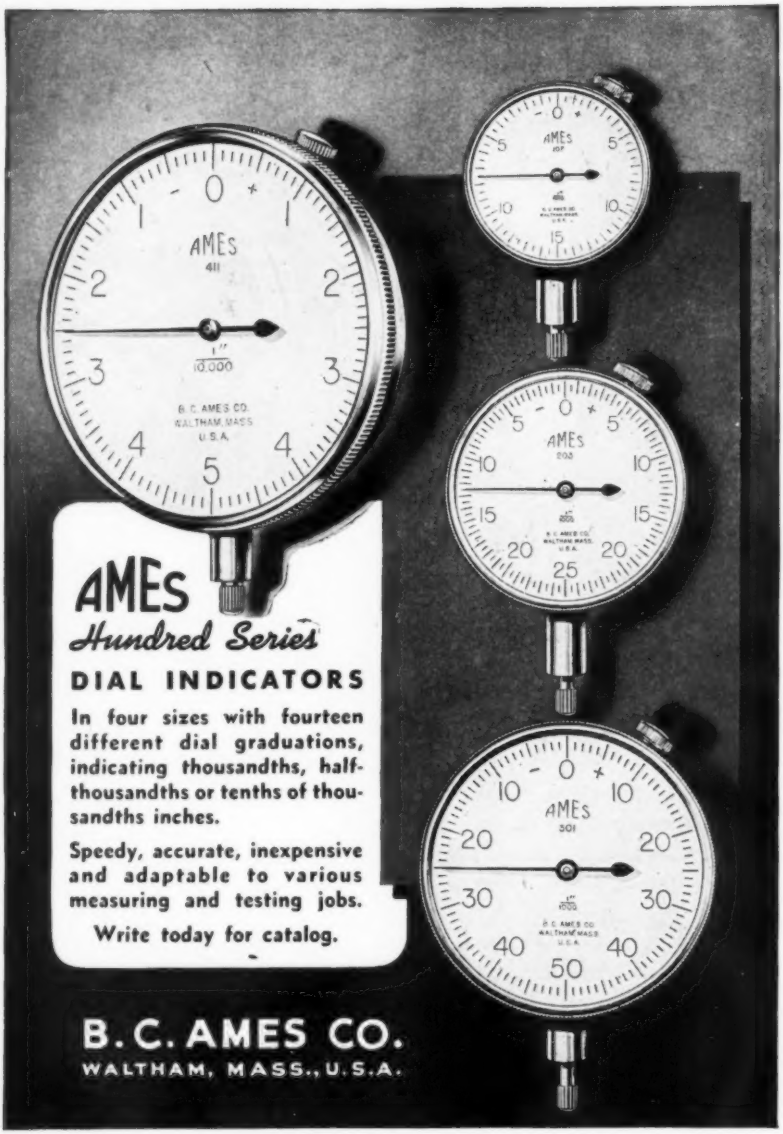
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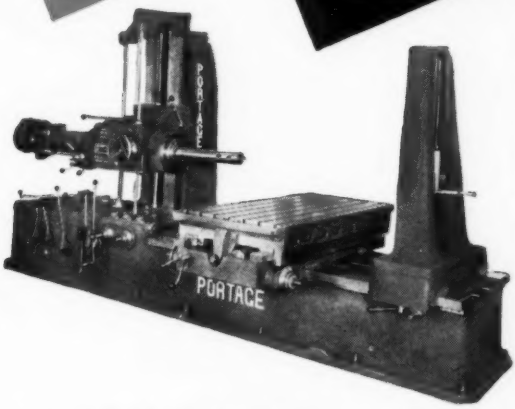

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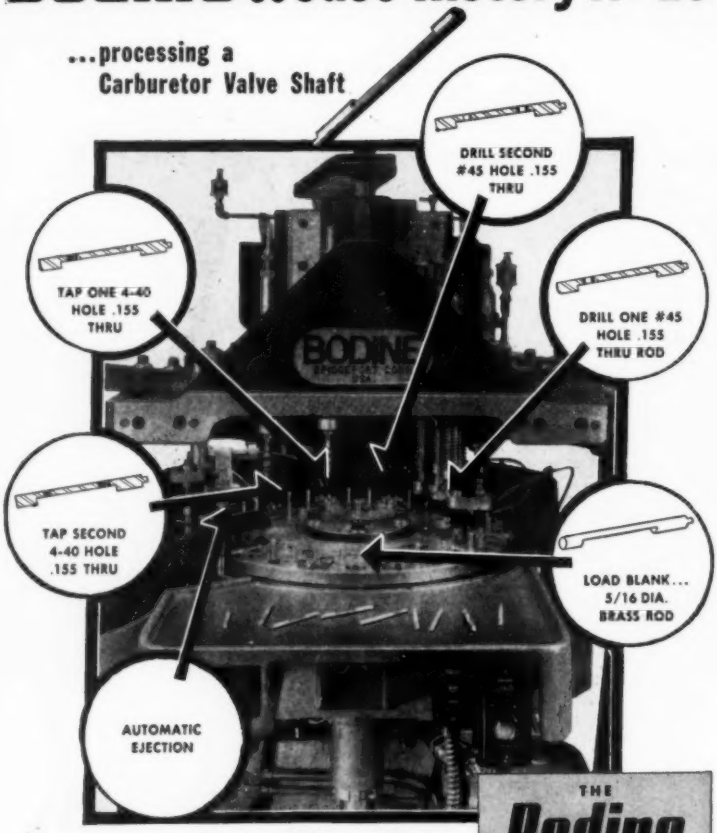
Bodine..Case History No. 16

...processing a Carburetor Valve Shaft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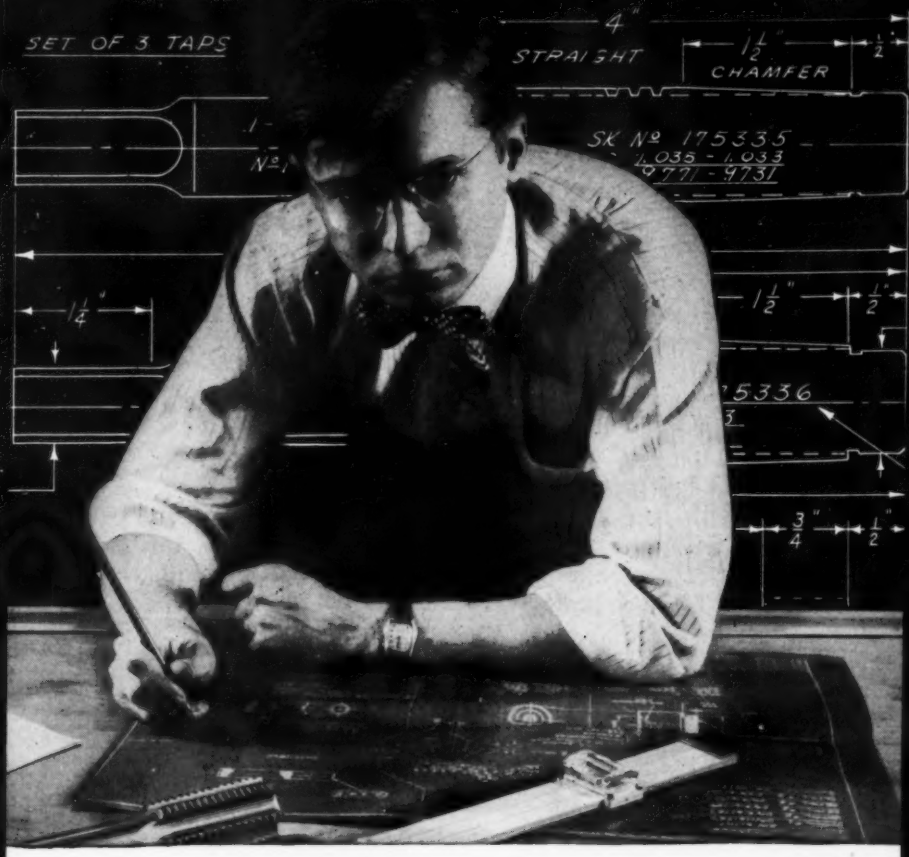
Your Threading GHQ



When the man in charge of "operations" runs into a new problem, he usually looks to "General Headquarters" for help . . . In threading operations on all industrial fronts, the man with a problem is able to go to the engineering department of the Greenfield Tap and Die Corporation for expert help. "Greenfield" engineers can focus on any problem the cumulative "know-how" of years of pioneering leadership in screw thread research.

"Greenfield's" threading "GHQ" helps solve specific day-to-day problems for users of threading tools, and also carries on an intensive continuing program of research that benefits all users. *If you have a threading problem, get in touch with "Greenfield" screw thread engineers through your "Greenfield" distributor.*

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GREENFIELD, MASSACHUSETTS

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You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear *and* you can weld them easily.

IMPROVED PACKAGE

One of the strongest, most practical and convenient boxes on the market. Cutaway feature shows inventory at a glance.

Box is solid chipboard construction that won't come apart. Saw securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.

Send for Atlantic Band Saw Booklet

ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively

153 Brewery St., New Haven, Conn.

Here's what we mean by

VISE-GRIP JAW

SPECIFICATIONS		
MODEL	SIZE	TOOL CAPACITY
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

With 15° or parallel cutter channel either left or right hand.

Exclusive in Clark Adjustable Tool Holder

Equalized pressure over *full* length of cutter channel—screw-operated jaw runs right to cutting edge, hugs bit so it can't slip, sag, or break! Takes 4 or more sizes of square, round, short or narrow tool bits. Parallel models for carbide bits, threading tools and boring bars.

Call your Clark Cutter Jobber today, or write for catalog MTBB-6

CLARK CC CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BLVD. • BEVERLY HILLS, CALIFORNIA

PRECISION REID SURFACE GRINDERS

46 YEARS of PRECISION MANUFACTURING

You Will Find

REID PRECISION SURFACE GRINDERS BUILT TO HANDLE YOUR WORK IN AN EFFICIENT AND TIME-SAVING WAY. EVERY POSSIBLE IMPROVEMENT HAS BEEN MADE TO ASSURE YOU CLOSE TOLERANCE AND A FINER FINISH AT LOWER COST. ALL WORKING PARTS ARE DESIGNED AND FITTED TO PREVENT ABRASIVES FROM PENETRATING AND CAUSING UNDUE WEAR. ACCESSIBILITY AND NEW DESIGN OF HANDWHEELS ASSURE YOU ACCURATE FINGERTIP CONTROL. AN OUTSTANDING PRECISION MACHINE.

BALANCED DESIGN - ATTRACTIVE FINISH. MODERATE COST.

ILLUSTRATED IS THE REID MODEL 2-B ALL-ELECTRIC POWER FEED.

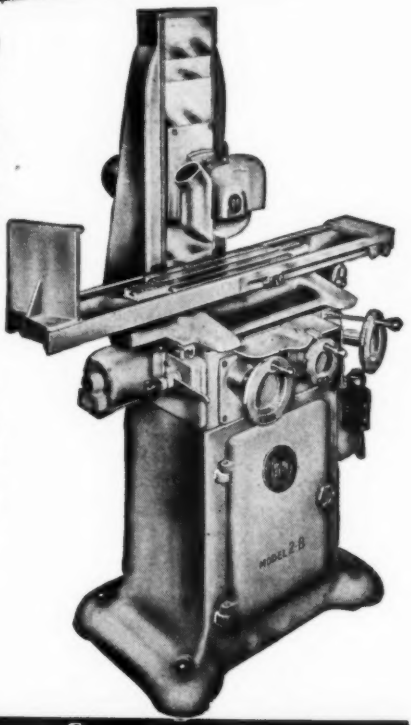
THE REID MODEL 2-C HAND-FEED ALSO IS AN EXCEPTIONAL MACHINE FOR TOOL, GAGE, DIE AND CERTAIN PRODUCTION GRINDING.

MACHINES EQUIPPED FOR WET GRINDING IF REQUIRED.

EXCELLENT DELIVERIES

DISTRIBUTORS CONVENIENTLY LOCATED IN ALL SECTIONS

Write Dept. G for Illustrated Bulletin and Prices.



REID BROTHERS COMPANY, INC.
BEVERLY MASSACHUSETTS

ACRO

Die set pullers

GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

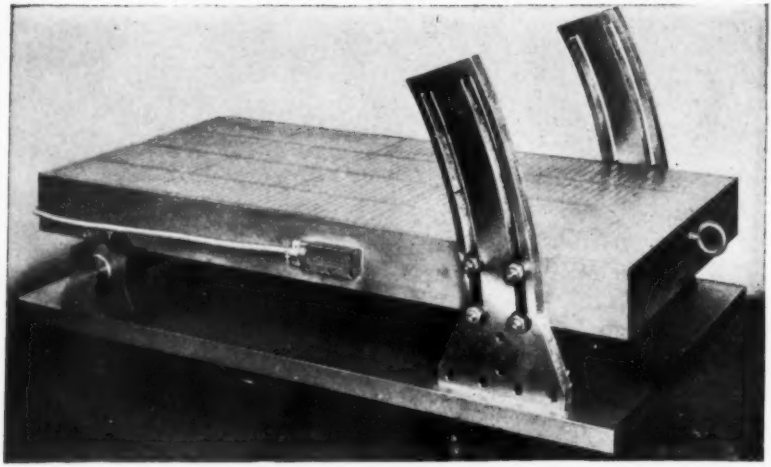
ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

Order a set today. Convince yourself of the savings you can make in your tool room. **ACRO PULLERS** furnished in three sizes. Write now for more information.

PROMPT DELIVERY

ACRO METAL STAMPING CO.

332 E. RESERVOIR AVE. MILWAUKEE 12, WIS.



WALKER'S appreciate their obligation to the Metal Industry in solving and anticipating customer requirements.

WALKER engineers with over a half century of background and experience are qualified to offer solutions to magnetic problems.

WALKER chucks are universally used throughout the world.

WALKER engineers are constantly developing new magnetic chuck applications.

WALKER invites you to submit your problems for their solution at no obligation.

Walker Chucks

O. S. WALKER COMPANY
INCORPORATED
ORIGINAL DESIGNERS AND BUILDERS OF MAGNETIC CHUCKS
MAGNETIC CHUCKS • GRINDING MACHINES
WORCESTER 6, MASSACHUSETTS

2 New ALCO Tools

COMBINATION
ROLLER STOP AND SUPPORT

Since this Alco Roller Stop was first introduced, we have received hundreds of letters complimenting us on our engineering foresight in furnishing a stop which serves a dual purpose. Used as a stop, it revolves with the work so that the end of the work is not marred and on delicate work, one finishing operation can be saved. There is no friction between the stop and the work such as occurs when a stationary stop is used. There is no oil splash when the work hits the stop and the concentric alignment feature in this Alco tool centers the stop on the work exactly.

The same tool, when equipped with special inserts, serves as a revolving support for long pieces or where very accurate forming operations call for absolute rigidity. Supports are made to fit the contour of the work and are easily and quickly inserted in the holder. This tool can be changed from a revolving support to a revolving stop and vice versa in just a few minutes.

SPRING SCREW
THREADING DIE HOLDER

The Alco Spring Screw Threading Die Holder opens new fields where the very accurate spring die can be used. To those operators who know the accuracy of work delivered by the spring die versus the acorn or button die, this new holder for the spring die will eliminate all the "bugs" which previously had to be overcome. In the spring die, the cutting edges are exactly parallel with the shank diameter so that regardless of the depth of cut, each tooth does the same amount of work. The Alco Spring Screw Threading Die Holder, with its flanges for controlling concentric alignment, keeps the die exactly centered on the work so that not only are perfect threads cut but dies last longer because of even wear.

To those operators who have avoided using spring dies because of the seemingly insurmountable mechanical difficulties encountered in trying to hold the die in alignment with the work, we predict a real thrill in the excellence of work produced when these dies are held in this new tool.

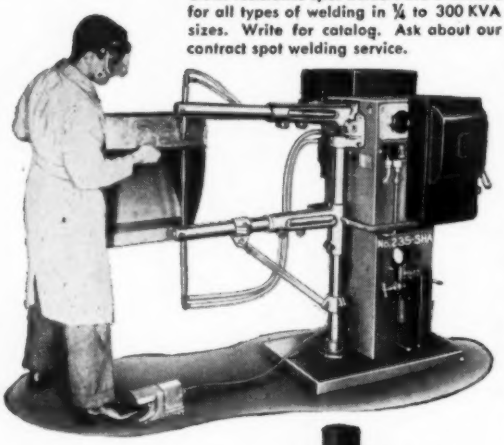
SEND FOR CATALOG

ALCO EFFICIENT TOOLS

THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.
Detroit Office: 2441 Field Ave., Phone DIXson 2434
Chicago Office: 608 So. Dearborn St., Phone Webster 2868

Spot · Butt · Arc WELDERS

Eisler resistance spot welders are available for all types of welding in ¼ to 300 KVA sizes. Write for catalog. Ask about our contract spot welding service.



Ask for Eisler's latest catalog.

35KVA. Air operated. Slide Horn. Adjustable Arms. Weld Timer and Contractor. Excellent for universal applications.

75KVA. Multiple Press Type. Air operated. Weld Timer and Contractor.

Arc Welders
100 TO 400 AMPS.

Butt Welders

FOOT
AIR
MOTOR
OPERATED

Spot Welders

PRESS
TYPE

Spot Welders
FOOT, AIR
OR MOTOR OPERATED

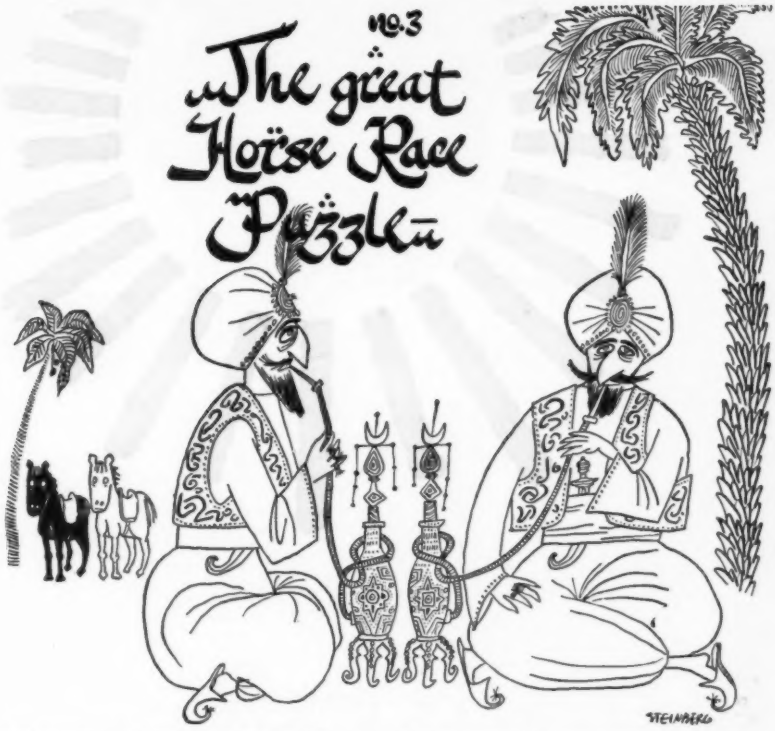
Chas. Eisler

Eisler ENGINEERING COMPANY

762 SO. 13th STREET NEWARK 3, NEW JERSEY

No. 3

The great Horse Race Puzzle



Said an aged Caliph to his two sons: "My time has come, You each own a spirited steed, so I propose a race to Bagdad — and the son whose horse last enters the city shall inherit my estate." For weeks the two sons dawdled upon the road, each striving to go slower than the other. Then, one night at an inn, they sought the counsel of a wise man . . . and the next morning, at the crack of dawn, they lept to the saddle and rode for Bagdad as fast as the horses could run.

What did the wise man tell them?

Moral: A little wisdom saves a lot of time in solving practical problems . . . and in the practical problems of metal turning, we consider ourselves to be wise.

Metal turning costs are a problem. The chances are that turning accounts for 25 per cent or more of all machining time in your plant.

There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the use of Jones & Lamson machines. Our machines are designed specifically for the most efficient use of carbide tools which can remove metal 200 to 500 per cent faster. We have solved many tough cost problems. Solving them is our business.

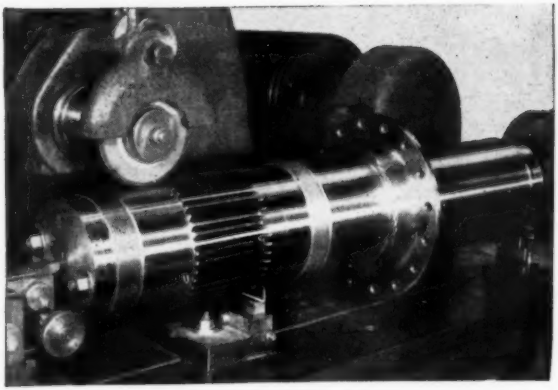
Be skeptical of the production efficiency of all metal turning equipment in your plant.

Telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

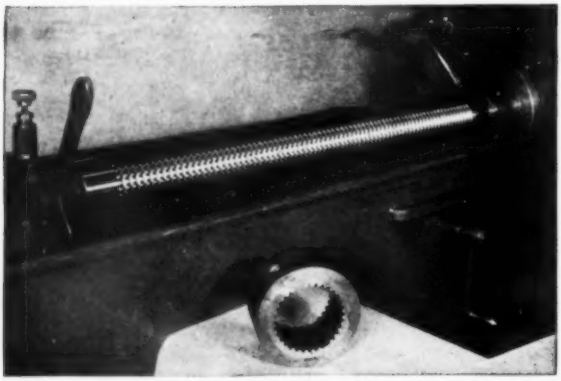
Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

Spline Grinding Aircraft Propeller Shaft



"In the Spotlight"

SPLINE BROACHES UP TO 84 INCHES LONG. Complete Broach Tooling and Engineering Service . . . GAGES, Serration or Spline, male or female . . . Master Gears and Gear Racks . . . Master Index Plates . . . Splined Arbors for gear-grinding . . . Hobbing, Shaving and Checking . . . Production Broaching and Machining. Available from stock, Radius Gages for checking form and hook on broach tooth forms.

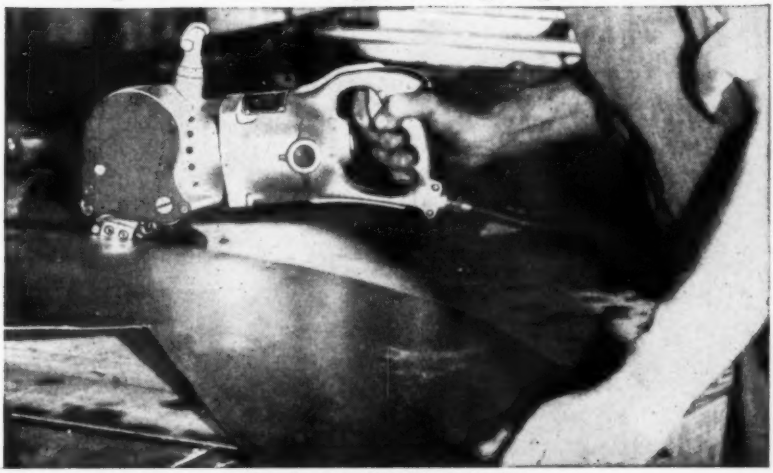


Involute Spline Broach and part of Wrench being Broached for Aircraft Engine Crankshaft.

GL B&G Co.

GREAT LAKES
Broach & Gage Company
1005 FRANKLIN STREET . . . DETROIT 7, MICHIGAN

Cuts 12 gauge hot-rolled steel any shape... interior or exterior easy as cutting out paper dolls



Stanley UNISHEAR 144A

You can short-cut dozens of heavy sheet metal jobs every month with this portable tool that does a shop job right on the job. Cuts clean—curves, straight lines, angles and notches—right to the line in heavy 12 gauge hot rolled steel and heavier gauges of softer metals . . . at speed up to 15 feet per minute. Trims turned up edges close to the surface. Makes inside cuts from a 3" starting hole. Light and easy to handle. Interchangeable, easily sharpened blades.

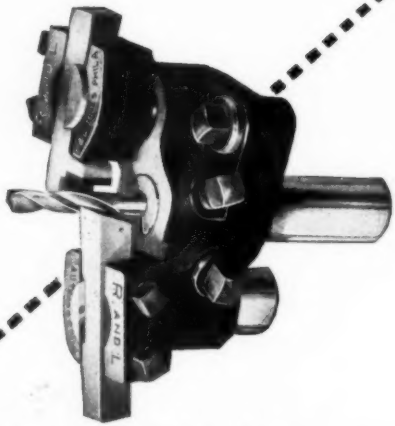
You need the money this UNISHEAR can save you. Ask your distributor for a demonstration or write for full information. Stanley Electric Tools, New Britain, Conn.

STANLEY
Trade Mark

STANLEY UNISHEARS

Electrically Driven Metal Shears

R and L RIGHT---> to



<---LEFT in 10 Seconds...

with R and L Turning TOOLS

Production savings are important in post-war work. Here is a tool that will save time and money in your shop.

R and L tools increase production by reducing set-up time, by speeding cutting operations, by doing right and left hand turning and by performing several operations simultaneously.

One R and L Turning Tool takes the place of an assortment of 14 separate tools costing 4 times as much! R and L are made in five different sizes . . . and delivery can be made from stock.

Let us send booklet describing R and L Tap and Die Holder, Roller Backrest and Universal Tool Post.

R AND L TOOLS

1825 BRISTOL ST., NICETOWN, PHILADELPHIA 40, PA.

METAL Stampings DUPLICATED WITHOUT DIES

With DI-ACRO Precision Machines

If you desire to save time and die expense on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

SHEARS

Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width—Shear No. 1—6". Shear No. 2—9". Shear No. 3—12".

BRAKES

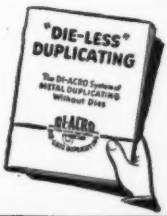
Di-Acro Brake forms non-stock angles, channels or "Vees." Right or left hand operation. Folding widths: Brake No. 1—6". Brake No. 2—12". Brake No. 3—18".

BENDERS

Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity—Bender No. 1—$\frac{1}{11}$" round cold rolled steel bar. Bender No. 2 and No. 3—$\frac{1}{2}$" cold rolled steel bar.

Send for Catalog "DIE-LESS DUPLICATING"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.



DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

<< Pronounced "DIE-ACK-RO"

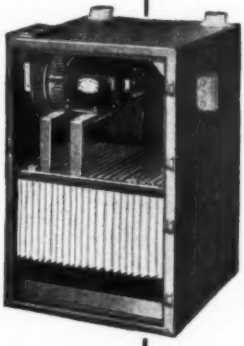
O'NEIL-IRWIN MFG. CO.

314 Eighth Ave. So.
Minneapolis 15, Minn.

TORIT DUST COLLECTORS

remove abrasive and polishing dusts at the machine and recirculate the air back into the room.

TORIT Dust Collectors are designed to meet the exacting requirements of modern industrial operations. Self-contained and portable they can easily be fitted into present and future production layouts.



TORIT Dust Collectors range in size from ½ HP to 3 HP. Applied at the machine they eliminate extensive piping and reduce power consumption. They are the perfect answer to your dust problems. For complete information and the TORIT catalogue write:

TORIT MANUFACTURING CO.
303 Walnut Street St. Paul 2, Minn.

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

General Electric engineers have devised a method of measuring the temperature inside a gas turbine by making some of the parts of a special chrome cobalt alloy which changes color with increasing heat.

get ready with CONE for tomorrow

New Holland Machine Co. expects to be ready to market a new flame cultivator that is expected to weed cotton at a cost of less than fifty cents an acre.

get ready with CONE for tomorrow

Patent 2,393,594 covers the use of ammonium nitrate in liquid anhydrous ammonia as a fuel for internal combustion engines. Since this fuel contains its own oxygen, an engine using it could operate at high altitudes without dependence on the atmosphere.

get ready with CONE for tomorrow

A novel automobile, designed by Preston Tucher of Ypsilanti, Michigan, now in the road-test stage of development, is reported to have many unique features, such as front fenders that turn with the wheels, three headlights that are dimmed by a photo-electric cell, sealed radiator and center steering wheel. The two-, four- or six-cylinder opposed engine has an aluminum block and fuel injection, but no flywheel and is placed between the two rear wheels. A liquid "torque converter" replaces clutch, transmission, drive shaft and differential.

get ready with CONE for tomorrow

Businessmen will soon be offered a triangular desk made of novel woods by Fletcher Aircraft Corp. of Pasadena.

get ready with CONE for tomorrow

New York Central has a hot box alarm on its new passenger cars that signals by both smoke and smell.

Pennsylvania Railroad has a new machine that prints tickets as they are sold and also takes care of the ticket seller's bookkeeping.

get ready with CONE for tomorrow

Sacro Mfg. Corp. of Bethlehem, Pennsylvania, has an under-the-sidewalk electrical snow-melting system, designed by A. M. Byers Co., that is set in operation by the weight of snow.

get ready with CONE for tomorrow

General Electric expects to deliver the country's most powerful electric locomotive in 1946: weight 500 tons, length 143 feet, 8000 horsepower.

The Bell System will test mobile radio-telephone service for automobiles on three highways: New York-Albany-Buffalo, Chicago-Springfield and New York-Boston.

get ready with CONE for tomorrow

The modern trend in retail store architecture has resulted in the triple expansion of the Pittsburgh Plate Glass Company's Pittco plant, that makes metal trim for all glass store fronts.

get ready with CONE for tomorrow

One of the new ideas in jet engines, developed by Carney Associates Ltd., New York, has two cylinders firing alternately and intermittently in such a way as to make rotating parts for air supply unnecessary.

get ready with CONE for tomorrow

Pontiac, Michigan, is experimenting with a small house, one-third of which is rolled aluminum. It is not prefabricated, but built on the site.

FOUR

in ONE!

Four parts machined in the time for one is *profitable* production.

The set screw blanks shown are made from SAE-3135 bar stock within the time and precision specified—and *four* at a time.

Why not investigate the *profitable* adaptation of the Conomatic VERTICAL to work in your shop? Write for literature.

Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

DUBLIFE
REVERSIBLE
PLUG GAGES

Twice the Life
Cuts Gaging Costs in Half

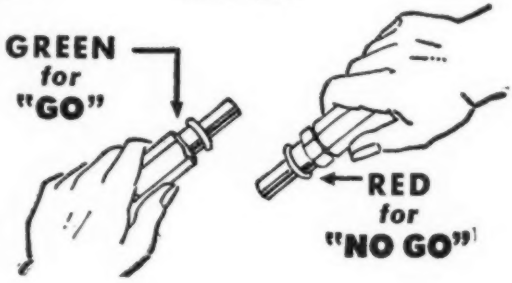
Check These Advantages — You get Them 'ALL In UPPCOLLOY REVERSIBLE Plug Gages

NON-FERROUS ALLOY with 20 times the life of the best steel.
TOUGHNESS — made to stand continuous hard use. No chipping.
NON-CORROSIVE — Rust proof. No rusting in storage or in handling.
NON-MAGNETIC—Will not pick up chips that might injure work.
HANDLES are marked plainly and are easy to grip and use.

TAMPER PROOF — Handles are equipped with a special drift for removing plugs. This drift is kept in Inspection Department where only changes may be made.

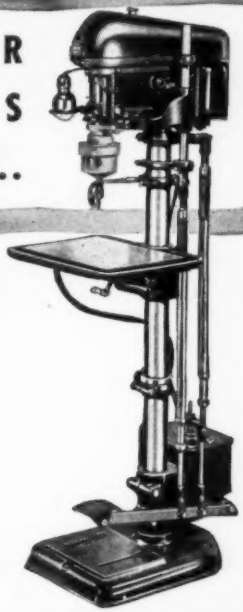
REVERSIBLE — This feature gives two "Go's" and two "No Go's" in one gage handle. Either can be reversed when worn and you have an accurate gage.

COLORED PLASTIC COLLETS
Color identifies plug instantly. Weight is reduced. Secure locking — no slipping. No marring or scratching of plugs as with metal collets.



UNITED PRECISION PRODUCTS
3522 WEST BELMONT AVENUE, CHICAGO 18, ILLINOIS

EVERY OPERATOR QUICKLY LEARNS PRECISION TAPPING..



on a Procunier Tapping Machine

Special design of the new Procunier Universal Tapping Machine makes it possible for the most inexperienced operator to learn accurate tapping in an amazingly short time.

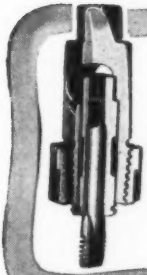
Two long, compensating springs take all of the "guess-work" out of the tapping operation . . . on both bottom and through tapping. Tap feeding and reversing pressures are preset and adjustable to the individual tapping job — *entirely* independent of the operator. These pressures remain constant, regardless of the pressure on the foot pedal. Dull or loaded taps are quickly spotted. Procunier low-cost tapping machines have many exclusive features. Send coupon for circular giving full details, specifications and prices.

PROCUNIER

14 S. CLINTON
CHICAGO 3, ILL.

AUTOMATIC LUBRICATOR

The Procunier Automatic Piston Type Lubricator supplies the correct amount of lubricant to the tap during the tapping operation.



TRU-GRIP TAP HOLDER

This tap holder drives the tap by the squared portion of the shank, keeps it in true by the round. The result is longer tap life, with no tap shanks "chewed" or damaged.

SEND FOR BULLETINS

PROCUNIER SAFETY CHUCK CO.
14 S. Clinton St., Chicago 3, Ill.

Please send me free bulletins on ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

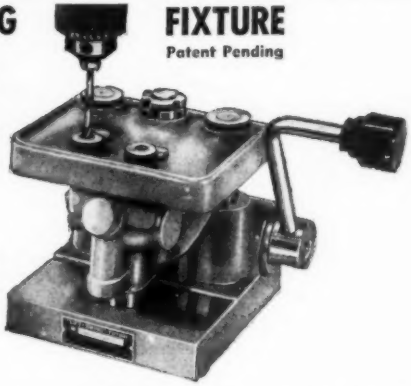
Name .....

Address .....

NOW!! YOU CAN REALLY REDUCE YOUR DRILLING COSTS With A MORE PRACTICAL DRILL JIG-VISE

THE LIFT-SWING FIXTURE

Patent Pending



YOU CAN LOAD AND UNLOAD FROM THE TOP

(Top can be swung one side as illustrated below.)

THINK WHAT THIS MEANS

Much faster operation — much easier operation and a much greater range and variety of jobs per size fixture. Extra top plates can be purchased easily and quickly installed.

After drilling, top can be quickly swung one side and without removing piece from fixture, you can body drill, chamfer, counter-bore or tap.

WHAT A SAVING OF TIME as well as a greater degree of accuracy and alignment of the finished hole.

Larger size jigs are made with a hinged top that can be swung backwards — very sturdy in construction and embodying the same time saving and precision features as in the smaller lift-swing type.

CHOICE TERRITORY OPEN FOR CHOICE REPRESENTATIVES.

WRITE FOR COMPLETE PARTICULARS

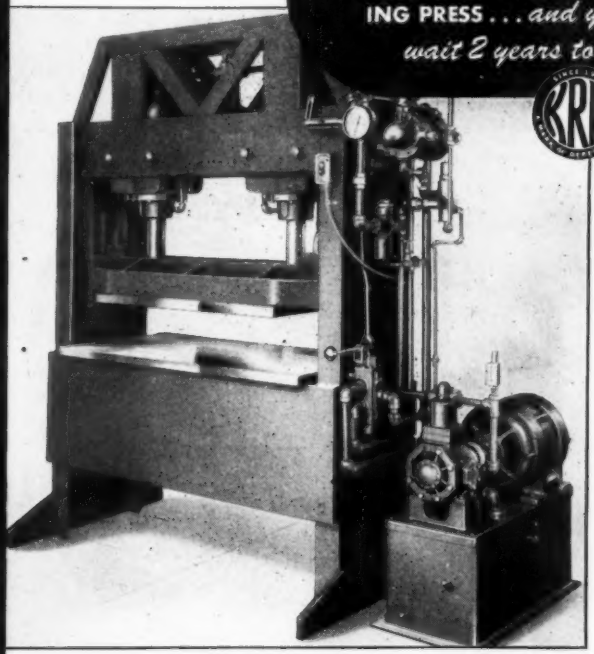
LIFT-SWING FIXTURE CORPORATION

237 SOUTH AVENUE **GARWOOD, N. J.**

STANDARD SIZES IN STOCK

HERE'S TOMORROW'S FORMING PRESS *Today!*

KRW ENGINEERING SCOOPS THE FIELD WITH THIS LOW-COST... SUPER-EFFICIENT ... LIGHT-WEIGHT BLANKING AND FORMING PRESS ... *and you don't have to wait 2 years to get delivery.*



Read these Specifications

KRW 80-TON BLANKING, FORMING AND STAMPING PRESS

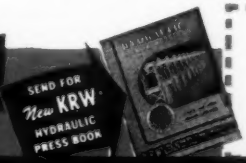
Lower Face Plates	24"x34"
Upper Face Plates	20"x34"
Day Light	14"
Piston travel	7½" Automatically Controlled Stop
Height overall	88"
Width Overall	82"
Ram Pressure	80 tons
Piston speed	8 feet per min. Return ... 11 feet per min.

● One of the soundest developments to come out of the war technology was the trend toward lighter and more efficient machine tool equipment. Startling proof of that development can be found in the new KRW 80-Ton Blanking and Forming Press. In this unit, KRW engineering experience has discarded tons of needless weight and cut thousands of dollars in cost from previous conceptions of this type of press.

All this has been done without any sacrifice in operating efficiency.

These new KRW Presses can consequently be built and delivered in a matter of weeks, *not years.* They can be built with open or closed ends and with greater or less capacity than the one illustrated. Tell us what your problem is, and we will engineer a press to solve it. Mail the coupon for our new Hydraulic Press catalog.

K. R. WILSON
BUFFALO 3, NEW YORK



K. R. WILSON, 215-217 Main Street, Buffalo 3, N. Y.
Please mail me a copy of your New Hydraulic Arbor Press Catalog.

Name .....

Address .....

City & Zone ..... State .....

13

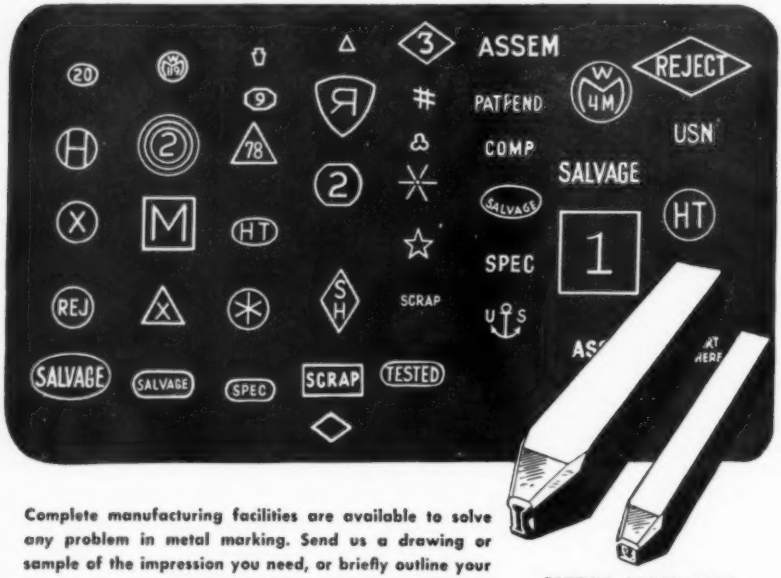
If it's for marking metal

Mercury has it

...or can make it!

Whatever your metal marking need may be—for inspection stamps, individual letters and figures, or complete sets for part numbering—Mercury can fill it!

Standard and special inspection stamps like those illustrated, for example, are carried in stock ready for delivery, or can be quickly produced to your requirements if desired.



Complete manufacturing facilities are available to solve any problem in metal marking. Send us a drawing or sample of the impression you need, or briefly outline your requirements for a prompt recommendation. *Full details are yours for the asking—write Department B today.*

METAL MARKING TOOL SPECIALISTS FOR OVER 25 YEARS

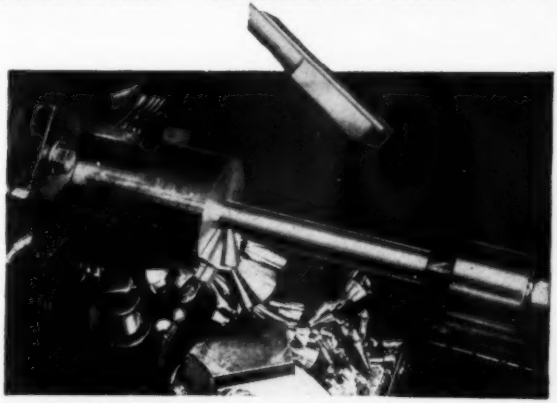
MERCURY METAL DIE AND LETTER CO.

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

AMAZING! INCONCEIVABLE! UNBELIEVABLE!

NEW *PRE-SHARPENED* SHEARCUTTER TOOL BIT

Actual photograph of a 3/8" SHEARCUTTER Tool Bit in production taking a finishing cut 1 1/8" deep under power feed. (3" Diameter C.R.S., 300 RPM, .005 Feed, Cutting Speed 240 FPM.)

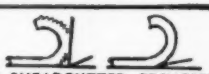


THIS AMAZING NEW INVENTION—

- Saves from 10% to 50% on labor costs.
- Increases production from 50% to 100%.
- Decreases power consumption from 30% to 70%.
- Takes extremely deep cuts with remarkable ease.
- Lasts from 3 to 5 times longer between regrinds paying for itself from savings in regrinding time alone.
- Generates less heat and saves on cutting compounds.
- Tends to resharpen itself automatically.
- Gives smoother finish and greater accuracy.
- Fits standard tool holders.
- Is interchangeable with less efficient tool bits.
- May be used on ferrous and non-ferrous metals, alloys and plastics.

YOU CANNOT AFFORD NOT TO USE THESE TOOL BITS!!

PATENT WARNING! Protected by numerous patent applications. Infringers will be prosecuted.



THE SHEARCUTTER PRINCIPLE Illustrated at left is the conventional type of tool bit, breaking down or tearing the metal. At right: The slicing knife-like action of Shearcutter Tool Bits.

FEARLESS TOOL CO.

1234 S. GRAMERCY PLACE, DEPT. B, LOS ANGELES 6, CALIFORNIA

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Localites, in various models, solve the problem of providing each industrial operation with the proper quantity and direction of illumination for the vital seeing task. The worker, according to his specific seeing need, directs illumination exactly where wanted. A Localite is his individual seeing tool, matched to his particular job. Thousands of plants now use this modern method of productive lighting. Let us show you the difference it makes.

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GENERALITES for Overall Lighting + LOCALITES for Light ON the Job

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Fostoria Lighting Equipment and Service Available through Selected Distributors from Coast to Coast.

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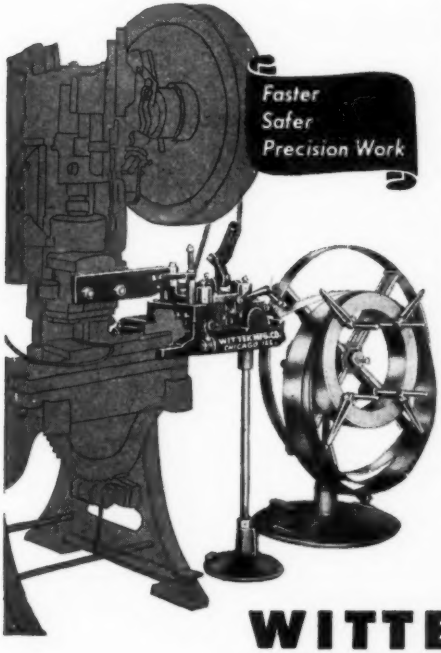
Equip with
WITTEK
Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

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4305-15 West 24th Place, Chicago 23, Ill.

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ROLL FEEDS
AND
REEL STANDS

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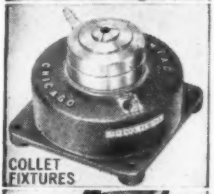

USE MEAD AIR POWER

Get faster, more economical production set-ups—investigate the entire "family" of Mead Air-Operated devices. Hundreds of progressive factories now use them to do better, faster, more economical jobs. Do you want to move things—lift them, slide them, tilt them—or hold them firmly? Mead Air Power will do it. Do you need a delicate, flexible touch—or tremendous pressure? Mead Air Power has them both. If you are interested in saving time, money and man-power now and for the future, investigate Mead Air-Operated devices now.

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Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.

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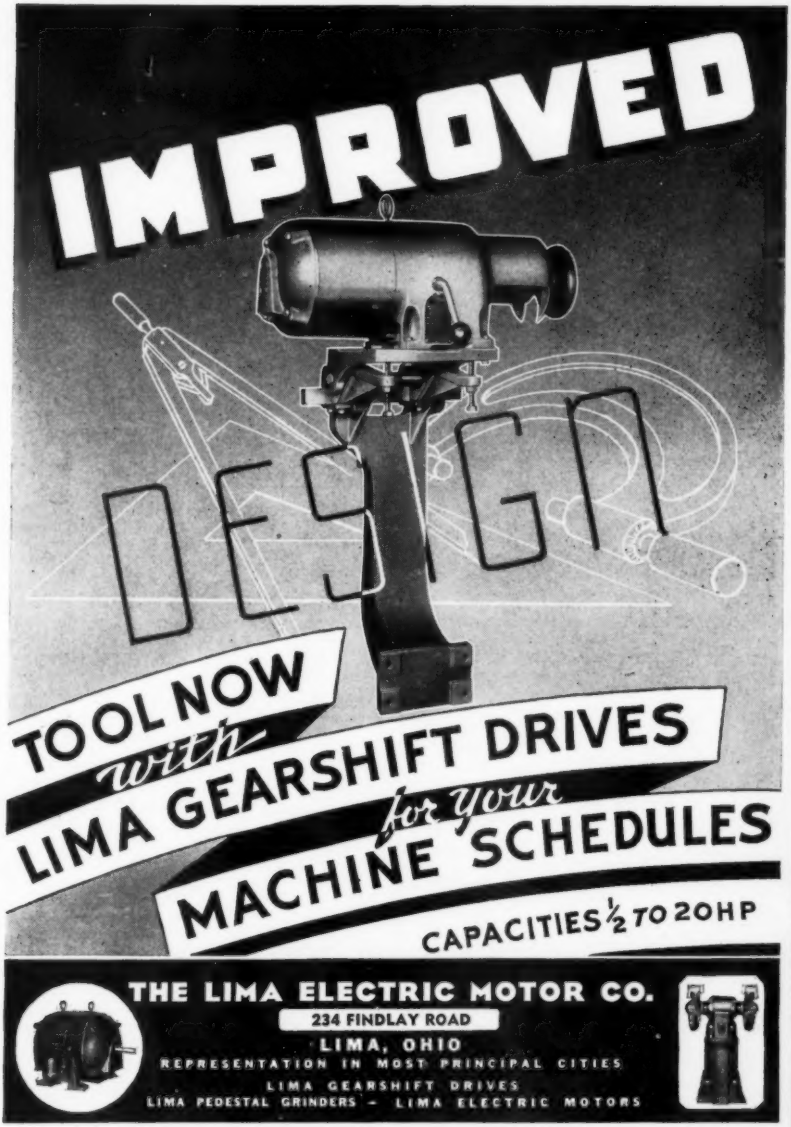
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TOOL NOW
with
LIMA GEARSHIFT DRIVES
for your
MACHINE SCHEDULES
CAPACITIES ½ TO 20 HP
THE LIMA ELECTRIC MOTOR CO.
234 FINDLAY ROAD
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REPRESENTATION IN MOST PRINCIPAL CITIES
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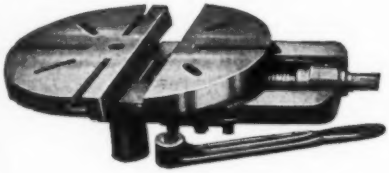
Use the COMBINATION

DRILL TABLE and VISE



SPEEDS DRILL PRESS SET-UPS

Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

GUARANTEE

We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.

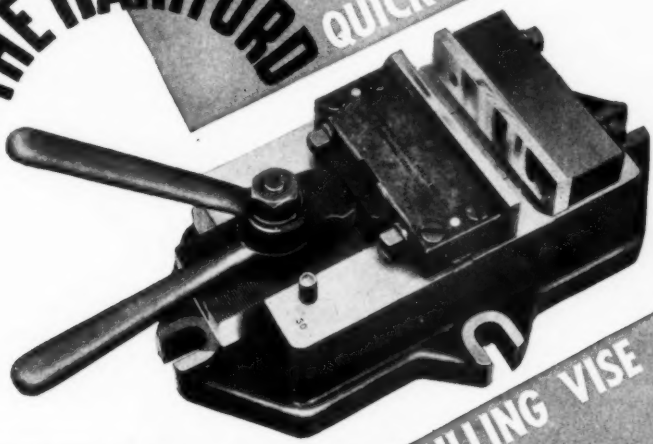
WRITE TODAY FOR CIRCULAR

Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.

Jackson, Michigan

THE HARTFORD QUICK ACTING MILLING VISE

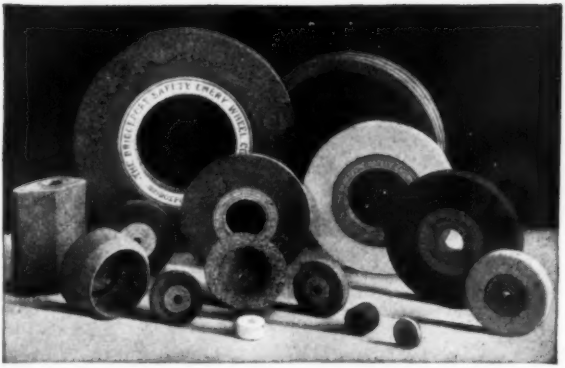


Proves its worth in time saving alone. Its powerful grip - - - speedy release - - - one hand operation and rugged strength quickly and satisfactorily handles many milling operations.

The construction of the movable jaw on the Hartford Milling Vise with its ground fitting surface makes it possible to hold single pieces at either end without distortion . . . and is especially adaptable for small arms or small part milling. This thoroughly modern vise merits your investigation. Write today for full details.

THE HARTFORD SPECIAL MACHINERY CO. . . . HARTFORD 5, CONN.

THE *RIGHT* WHEEL FOR EVERY GRINDING NEED



"Bridgeport" ALUMINA Wheels — Aluminous oxide abrasive—hard, tough, sharp—for grinding materials of high tensile strength. Cool, free cutting.

"Bridgeport" LC ALUMINA Wheels — Refined aluminous oxide, for certain types of surface grinding.

"Bridgeport" SILEXON Wheels — Carbide of silicon, harder than any mineral except the diamond and very brittle. Unsurpassed for grinding metals of low tensile strength, clay products, etc.

"Bridgeport" VITRIFIED Bond—Abrasive fused in ceramic clay. A wheel of great strength. Grades for most grinding jobs.

"Bridgeport" SILICATE Bond—Abrasive bonded in silicate of soda. Very free cutting. Excellent for knife and shear blade and general face and surface grinding—also for large wet tool grinders.

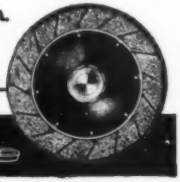
"Bridgeport" RESINOID Bond—Synthetic resin bond. A wheel of great strength. Rapid metal remover. For speeds up to 9,500 SFM in foundry work, and up to 16,000 SFM in cut-off work.

BuXite — *the new abrasive*

A new "case hardening" process for all types of abrasive wheels. Grinds carbide and cast alloy cutting tools at substantially lower cost. Less heat, finer finish, no "loading". If you grind superhard tools and materials, ask for the interesting story of "BuXite".

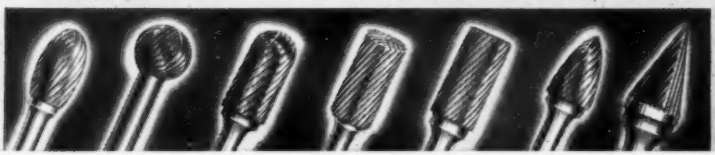
THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U. S. A.

Bridgeport



GRINDERS • GRINDING WHEELS • BUFFING LATHES

Carburs PRODUCED BY MEN WHO *Know* CEMENTED-CARBIDES



Over a number of years, Lincoln Park's history has shown a series of "firsts" in application of cemented-carbides to the manufacture of gages and tools. One of these was the introduction of Carburs—industry's first cemented-carbide rotary files.

Today, Carburs have been thoroughly proven in every type of production. Original claims that their service life would be "at least 50 times that of steel rotary files" have, in numerous instances, been greatly exceeded. Every other claim for performance and production cost reduction has been more than fulfilled.

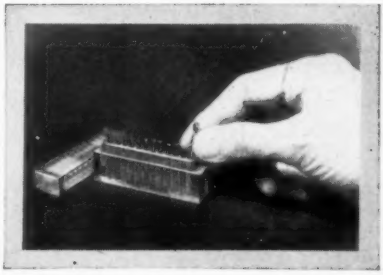
If you use rotary files, you'll find many advantages in those made of cemented-carbide. To be sure that you get the best, you'll find it will pay to specify *the original* cemented-carbide rotary files . . . manufactured by a company with unexcelled experience in cemented-carbide work . . . and that still rank far ahead in sales of tools of this type. They are Carburs —made by Lincoln Park.

MIDGET CARBURS

Carburs in midget sizes, 1⅛ inches overall with ⅛ inch diameter shanks, are available for tool room, die shop, pattern shop and general production use. They are made of solid cemented-carbide.

Midget Carburs are supplied as individual tools or in sets of twelve tools of assorted shapes furnished in an extremely practical and attractive plastic case.

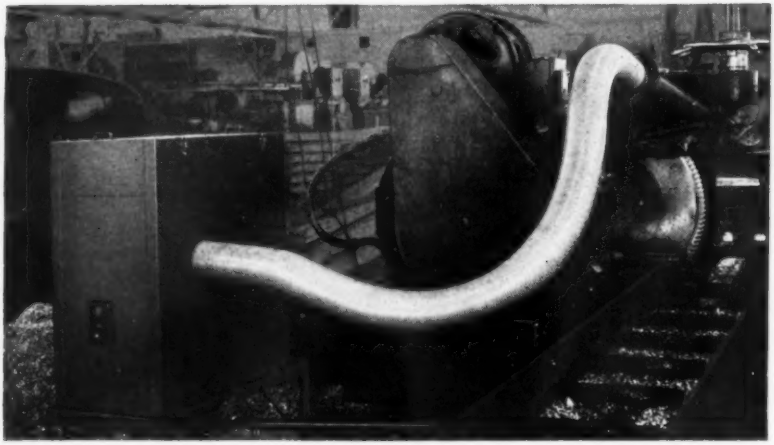
NEW LITERATURE SHOWING ALL CARBURS NOW AVAILABLE AND LISTING NEW REVISED PRICES WILL BE SENT YOU UPON REQUEST.



Lincoln Park INDUSTRIES, INC.

1731 FERRIS AVENUE • DETROIT 25, MICHIGAN

STOP DUST WITH DUSTKOPS



Model 1150 DUSTKOP Dust Collector collects all the chips (note pile in back of DUSTKOP) from aluminum extrusion cut-off. Paddle wheel fan direct driven by continuous duty motor clears any size chip or shaving; cyclone separator for a first stage cleaning is followed by spun glass filtering of air before recirculating to work space.

DUSTKOPS require no duct work: Install in minutes.

New style, low cost, spun glass filter, is fire-safe, easy to shake down and seldom needs renewing.

Model 420 for small tool grinders, surface grinders, small wheel buffers, polishers, sanders, etc.

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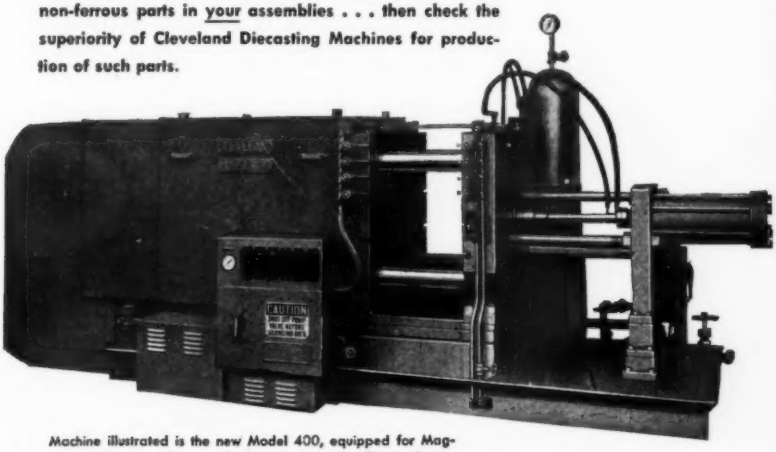
605 First National Bldg.
ANN ARBOR, MICHIGAN
Phone 2-5585

Ask for complete information NOW on DUSTKOPS.
DUSTKOPS are LOW IN COST, EASY TO INSTALL, FULLY PORTABLE.

Have You Looked Squarely at Die Casting?

Despite tremendous increase in the use of diecastings in every kind of modern assembly, we wonder, at times how many otherwise up-to-date manufacturers have not yet gotten all of the facts regarding this fast, accurate, low-cost method of parts production. Just as a guide to *your* thinking on the subject, check the number of diecast parts, both interior and exterior, on the newest automotive models. Check the fact that nowhere are there more critical requirements as to low cost, durability, assembly-precision, and appearance. Check carefully the possibilities of diecast non-ferrous parts in your assemblies . . . then check the superiority of Cleveland Diecasting Machines for production of such parts.

THIS IS THE NEW CLEVELAND UNIVERSAL HIGH PRESSURE HYDRAULIC DIECASTING MACHINE. We believe it is the most practical machine available, because of its unusual simplicity, heavy duty construction and job-proved capacity for high production of uniform quality castings.



Machine illustrated is the new Model 400, equipped for Magnesium, Aluminum, Brass or Bronze alloy casting. Simple change of the hot metal end equips same machine for casting Zinc, Tin or Lead alloys. *Ask for Bulletin D446.*

THE CLEVELAND AUTOMATIC MACHINE CO.
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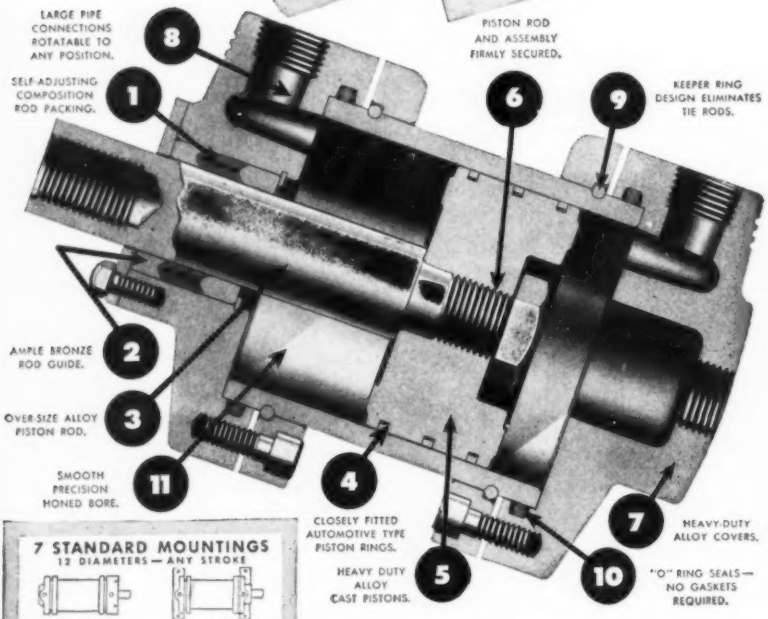
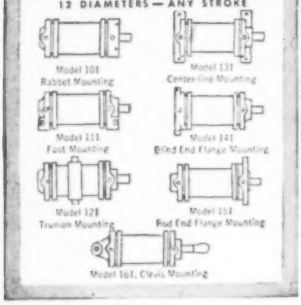
11 Reasons WHY

GEROTOR HYDRAULIC CYLINDERS HANDLE YOUR POWER NEEDS EFFICIENTLY



7 STANDARD MOUNTINGS
12 DIAMETERS — ANY STROKE


Model 101 Rabbet Mounting
Model 131 Center-line Mounting
Model 111 Foot Mounting
Model 141 Blind End Flange Mounting
Model 121 Trunion Mounting
Model 151 Rod End Flange Mounting
Model 161 Clevis Mounting

Gerotor hydraulic double-acting non-rotating cylinders are designed for 750 P.S.I., 1500 P.S.I., and 3000 P.S.I. oil or water service.

Keeper ring design eliminating need of tie rods permits covers to be rotated to convenient pipe location. "O" ring seals assure leak proof operation with sealing efficiency improved with increased pressure.

Cushioning feature available on all models. Special cylinders supplied to specifications.

GEROTOR MAY CORP.
MARYLAND AND OLIVE STREETS
BALTIMORE, MARYLAND

Featured In This Issue

AN ACKNOWLEDGEMENT, and expression of appreciation from the Editors to Westinghouse Electric Corp., for furnishing speech-transcriptions and photographs of the proceedings at the Machine Tool Forum which they held at Pittsburgh last April. A number of these speeches and pictures are reproduced in this issue.

ELIMINATION OF VIBRATION in machine tools, Rolland C. Griffith, Research Engr., of the Heald Co., tells us how it can be achieved in the story on page 129

TOOL ENGINEERING AND PROFITS is the subject discussed recently before the ASTE by Ralph E. Flanders Pres., Jones & Lamson Co. on page 137

INDUSTRY REPORT ON STANDARDIZATION by R. P. O'Neill, Ass't. Plant Engr., Pontiac Div., General Motors Corp. The article starts on page 149

PRIZE CONTESTS are announced issue, the James F. Lincoln Arc Welding Foundation awards for Metal Working Machinery Manufacturers. For this see page.....159

The Second Contest is being sponsored by that aggressive organization, The Resistance Welders Manufacturer's Association. Details of this contest appear on page 172

REMOVING BROKEN TOOLS by cutting away cores describes a method developed during the war but equally applicable now. See page..163

ELECTRICAL EQUIPMENT FOR MACHINE TOOLS by G. A. Caldwell of Westinghouse Electric Corp. Read it on page 175

"LOOKING AHEAD" by George S. Benson presents some constructive ideas in concise form on page.....199

INTEREST RATES AND PROFITS are discussed and analyzed by Arthur Roberts. You'll enjoy his article because of its sincerity and understanding of the subject. See page 201

THE DYNAMIC SIDE OF FOREMANSHIP is Edmund Motterhead's subject in this issue. Various emotions and human peculiarities are discussed in detail. Read about it on page 209

RAPID REVERSING DRIVES, the problem of applying them is described by R. H. Clark of Warner & Swasey. In his article he covers a variety of uses and methods in actual practice. Turn to page.....229

MACHINE TOOL WIRING METHODS, one company's trend in this direction is discussed by A. L. Krause, Electrical Engr. for the Brown & Sharpe Mfg. Co. on page 237

ADJUSTABLE VOLTAGE DRIVES, case histories and practical applications of same is a subject discussed in a clear and very informative way by W. B. Wigton, Electrical Engr. for the Cincinnati Planer Co. You will find it on page 253

DISCONNECT CIRCUIT BREAKERS for machine tool control is covered at length by H. D. Dorfman of Westinghouse Electric Corp. It starts on page 267

STANDARD CONTROL TRANSFORMERS, sizes and ratings by E. E. Opel of National Automatic Tool Co., Inc., his article begins on page 281

WHAT'S NEW presents a broad variety of items, many of which came out of war experience and are now available. Turn to page 292

MECHANICS THRU THE AGES, page 376

PRODUCTS INDEX—a ready means of finding the products you want—see page 378

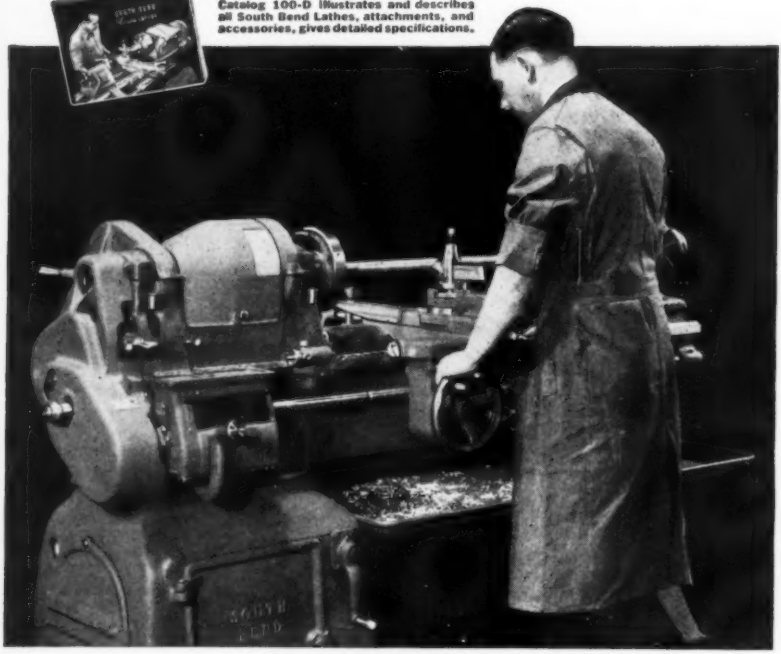
VERSATILE...

FOR A WIDE VARIETY OF PRECISION OPERATIONS

South Bend Precision Lathes offer special advantages to production shops, laboratories, and toolrooms that handle diversified work requiring a wide variety of exacting operations. They simplify change-over from one operation to another; help get new jobs into production quickly and economically. With their wide range of spindle speeds, they machine light metals, plastics, and steel with equal ease. A complete line of attachments and accessories enables South Bend Lathes to handle many operations which otherwise might require special fixtures or machinery. Take advantage of this versatility, coupled with South Bend precision, speed, ease of operation, and dependability, to increase the capacity and efficiency of your shop. South Bend Precision Lathes are made with 9", 10", 13", 14½", and 16" swings, collet capacities to 1", and bed lengths to 12'. Write for fully illustrated, complete Catalog 100-D.

WRITE FOR CATALOG

Catalog 100-D illustrates and describes all South Bend Lathes, attachments, and accessories, gives detailed specifications.



LATHE BUILDERS SINCE 1906

SOUTH BEND LATHE WORKS

426 EAST MADISON STREET • SOUTH BEND 22, INDIANA

As The Editor Sees It

Management — Are You Listening?

"The days when time was a fair measure of a man's productivity are almost gone! Today a man's productivity is no longer measured by the hours and minutes he works—but rather by the capacity and efficiency of the machine he operates.

"That's a revolutionary concept for both industry and labor, yet it is merely another step forward in the evolution of the volume production principle which has made America the greatest industrial nation on earth.

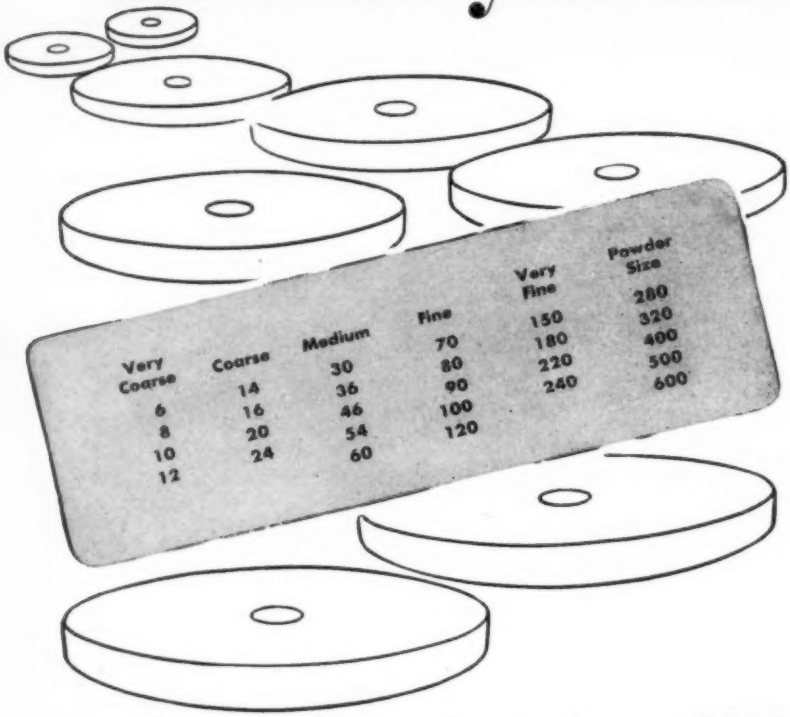
"Economics teach us, and industrial history shows, that when a company cuts the production cost of a product, it can offer that product at a lower price. As the price goes down its potential market increases. As its market increases, its volume goes up. As its volume goes up—it can hire more men. One of the fundamental principles of our competitive economy is that jobs are created by increasing the productivity of the worker.

"The modern machine tool is an important factor in this cycle of events. It is industry's instrument for reducing costs, and it reduces cost by increasing output, by doubling and redoubling the productivity of the individual worker.

"It is a major weakness of U. S. industry that the financial side of management is reluctant to accept obsolesence as an operating actuality. Common sense tells us, it is wasteful to drive and maintain a 1925 automobile with its uncertain operation, high cost of upkeep and uncomfortable riding qualities. It will run, sure, but how? An efficient modern car will operate with comfort, safety and speed—for one-quarter the cost! **Yet, today, operating departments of scores of plants are burdened with 20-year old machine tools, which by comparison with new models, show operating losses instead of profits. It is time to realize that a machine does not have to be worn out to show an operating loss."**

Note: The foregoing guest editorial was taken from a brochure "Depreciation vs. Obsolescence" written by Joseph L. Trecker, vice-president of Kearney & Trecker Corp. of Milwaukee, Wis. Mr. Trecker's keen analysis of this subject is so well expressed we felt it should be passed on to our readers.

How do you tell



A good rule for good grinding... **CALL**

which grit to use?

Listed is a commercial classification of standard abrasive grit sizes. They come in a wide range... from 6 classified as very coarse to 600 classified as powder size. And, the variety is further extended by special sizes and combinations. Yet, each one is designed to do a specific job better than any of the rest.

To complicate correct choice even more, there is a long list of variable factors to consider. Among these, you'll find wheel speed, machine condition, specified tolerances, material analysis, related production schedules, and a host of others.

The correct selection hinges on the review which is given to all the controlling factors. Yet... grinding efficiency and economy depend on the right answer.

That's why The Carborundum Company has put together a practical program... a service now deemed essential by many concerns who have been successful in getting improved grinding in terms of better finishes, or at lower cost.

Your nearest contact to this service is a CARBORUNDUM representative You'll find him willing and helpful. Through a sound knowledge of abrasives and first-hand experience of their use and application in the many plants he contacts, he is able to make intelligent recommendations and suggestions. On the more uncommon problems, he can even call on our Abrasive Engineers who are more fully qualified to tackle the tough problems. And, sometimes, the answer comes from the modern laboratories at CARBORUNDUM—where scientists and technicians probe for new information on abrasives, practices and developments.

Here is a sound approach—not only to getting the right grit—but the right combination of grit, bond, grade, structure and all the other parts that make up a grinding wheel. *Plus* knowledge and experience invaluable in modern grinding methods and procedures. It's easy to use. It incurs no obligation. It makes sense. The Carborundum Company, Niagara Falls, New York.

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TRADE | MARK

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WHEELS
Silicon Carbide
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RYERSON STEEL

Elimination of Vibration In Machine Tools

By ROLLAND C. GRIFFITH*

CHATTER marks found on finely finished surfaces can be caused by three kinds of vibration; forced, shock, and self-excited. Forced vibrations are initiated by the sources of power such as; motors and pumps, unbalanced rotating parts, ball and roller bearings, gears and any mechanism which transfers energy in uniformly timed impulses. Shock vibrations are the result of acceleration or deceleration of masses, such as the table. Shock also originates externally from passing trains, stamping machines, and hammers. Self-excited vibration is present in many metal cutting operations to some degree. Slowly moving tables and slides are often a source of self-excited or relaxation oscillations.

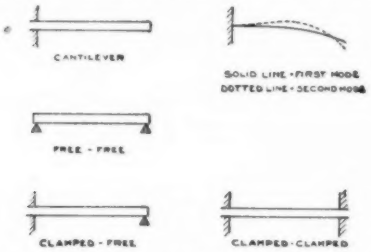

Figure 1—Four types of beams; a cantilever, a free-free, a free-clamped, and a clamped-clamped beam.

What is the significance of chatter? The average contour is not changed by chatter and boundary friction has not been found to change appreciably. Dayton's work indicates that initial run-in should be improved by chatter marks. Measurements to an accuracy of one ten-thousandth of an inch are unaffected. However, the appearance is certainly altered, making visual inspection more uncertain. Where surfaces are to be inspected with optical flats, chatter marks are confusing. A ring gage will appear spotted, or banded after using a few times with chatter marks only a few millionths deeps. During the war measuring instruments with an accuracy of five millionths of an inch were used but chatter marks with a depth of only a few millionths made measurement uncertain. Chattering reduces the life of single point tools, and harder grinding wheels are required on a rough than on a smooth machine. Workmen exercise greater care in handling nicely finished work, resulting in less spoilage.

A review of some of the major elements of mechanical vibration seems appropriate at this point. A single degree of freedom system is a spring supporting a mass as shown in Figure 2. When this is excited by a sinusoidal force of constant magnitude and gradually increasing frequency, the motion will be in phase with the force and of increasing amplitude until resonance is reached. Then the amplitude will be limited by the damping of the system primarily the internal loss of the spring.

*From a paper presented by Rolland C. Griffith, Research Engineer The Heald Machine Co., Worcester, Mass., at the Machine Tool Forum held at Westinghouse Electric Corp., Pittsburgh, Pa., April 9 and 10, 1946.

Increasing the frequency further, the amplitude will decrease and approach zero while the phase will have reversed, i. e., the motion will be in opposition

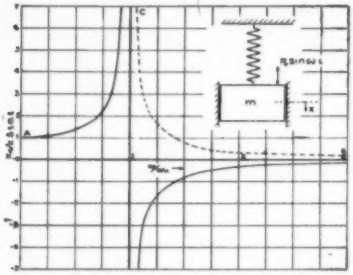

Figure 2—A spring and supporting mass illustrating a system having a single degree of freedom.

to the force. If a second mass is suspended by a spring from the first mass, a two degree of freedom system results. Then there will be two resonant points and the phase relations are rather difficult to describe.

Consider next a cantilever, a free-free beam, a free-clamped beam or a clamped-clamped beam as shown in Figure 1. When similarly excited each of these will have a first mode of vibration, a second mode about six and one half times the frequency of the first mode, a third mode about twenty-two times the frequency of the first mode and so on indefinitely. Thus a beam has an infinite number of degrees of freedom.

When one of these bars is vibrating, and if the amplitude along its length is

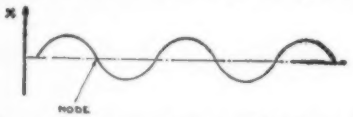

Figure 3—Sine wave for sinusoidal force of constant magnitude and frequency.

measured as shown in Figure 3, it will be seen that there are points of zero amplitude called nodes, separating regions of high amplitude. Furthermore, alternate regions reverse in phase. So, if a sinusoidal force of constant magnitude and variable frequency is applied, the amplitude, phase, and the number and position of the nodes will vary.

The foregoing is not too hard to understand and figure out, but if weights are added to the beam, and if one or more of these periodically changes position, analysis would be difficult. The simplest solution then would be measurement of a full sized model.

This is a fair description of a machine tool if a beam of variable section is substituted. It is interesting to note that this is approximately equivalent to an electrical transmission line with distributed and concentrated constants, the resistance corresponding to damping, the inductance to mass, the capacitance to the spring constant, the conductance to the contacts made with the floor, and the branch distribution lines to bridges, table and cross slide.

Consider the uniform beam again. If a sinusoidal force of constant amplitude

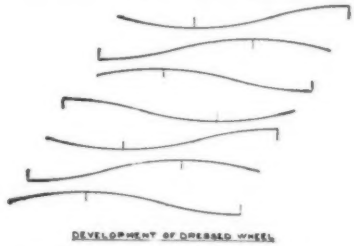

Figure 4—Development of Dressed wheel.

and frequency is applied and is slowly moved along the beam, and if this frequency corresponds to one of the natural nodes of vibration of the beam, the resulting vibration will be maximum when the application is midway between the nodes and minimum when applied at the nodes. In an internal grinder this corresponds to the wheelhead and motor moving along the base ways. Thus the amplitude of vibration of the base varies and excites the bridge and workhead in a pulsating manner for long work. And where the table stroke is short the amplitude will depend on the particular location of the table when grinding, i. e., at which point on the base the excitation is applied.

It becomes evident that the tool and the work, under the influence of a common excitation, will vibrate at the same frequency but each with its own amplitude and phase. If the phase and amplitude are identical, no relative motion will result. However, any other values will produce relative motion that leave chatter marks on the work surface. By the principle of superposition, each forced frequency will act independently producing its own chatter, often making trouble shooting difficult.

The above tacitly assumes forced vibrations only were involved. Self-excited vibration resulting from the cutting operation will produce exaggerated chatter and will react upon the whole machine exactly the same as any other source of pulsating energy.

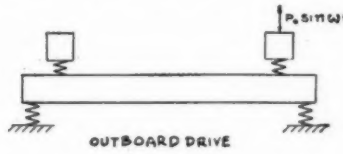

Figure 5—Outboard drive.

Shock vibration may be internal or external. The ideal method of mounting to guard against external shock is a soft mounting under the base. But since most machines are not self supporting, a heavy sub base is required. Practically, shock pads are made stiff enough so all the forced vibrations in the machine are below the resonance frequency of the mounting.

Internal shocks cannot be isolated. When they occur, each part of the machine acts as though struck by a hammer and vibrates at its natural frequency, gradually reducing in magnitude at a rate dependent on the damping. Chatter is invariably produced in this case, its depth a function of the impact.

It is interesting to note that a rough belt produces an irregular series of shocks or repeated transients. These excite the spindle resulting in a most confusing type of chatter, often not recognized as such.

The best solution for chatter produced by forced vibrations is to do away with the cause. Some progress has been made in this direction with induction motors and pumps. Induction motors have three major sources of pulsating energy; rotational unbalance, ball bearings, and the rotating magnetic field. Rotational unbalance is easily corrected, precision bearings reduce this source to an acceptable value, but the magnetic problem requires special treatment. A careful study of this source of vibration revealed that a symmetrical mounting about the bearings reduced the magnetically caused vibration in the ratio of 13:1. The mechanical vibration from pumps is effectively eliminated by soft mountings and neoprene hose but the hydraulic vibration cannot, as yet, be controlled. In an electrical circuit transmitting direct current with one or more alternating current components, wave traps can be used to smooth the voltage. But the frequencies from a pump, which are a few hundred cycles per second, cannot be by passed in the same way. It is impossible to design a piston and spring that will have the necessary displacement and at the same time have the correct natural frequency.

Outboard motors have been used on the premise that both the machine and motor are independently supported on a relatively immovable floor. See Figure 5. The equivalent is a heavy base supported on corner springs on which are mounted two stiffly sprung masses, one mass corresponding to the machine, the other to the outboard motor. The motor will have a vibrator fastened to it that produces a sinusoidal force. It is evident that an outboard drive should be used on solid massive floors only.

What has been said, though admittedly not complete, indicates the general method used in analyzing vibration problems. A few examples of actual problems may be of interest.

1. An unbalanced grinding wheel that runs true after dressing. Chatter is produced by the unbalanced force that causes a relative motion of the wheel and the work. The only solution is to balance the wheel.

2. Unbalanced work piece resulting in; (1) an eccentric bore, or (2) an elliptical bore when the support is not sym-

metrical elastically. Ordinarily, eccentricity or out-of-round will be but a fraction of a tenth. The best solution is to balance the work.

3. Failure to spark out. A workhead which was reported to spark every two and one quarter revolutions was set up and found to do just that. A similar anti-friction bearing was rotated by hand. It was noted that one roller made a complete revolution around the center of the bearing every 2½ revolutions of the inner race. Evidently one roller was slightly large causing the geometric center to rotate about the center of rotation. New bearings solved the problem.

4. During a cylinder grinding operation it was found that a chatter of 240 c.p.s. existed. Measurements showed no sizeable vibration other than 120 c.p.s. the wheel was turning 80 r.p.s., and this resulted in three spiral threads being formed on the wheel. Obviously, the wheel contacted the work three times per revolution producing the observed result. There were two possible solutions, the simplest being to replace the motor.

5. The profilometer reading of a bored

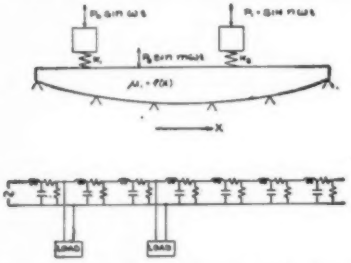

Figure 6—Electrical analogy of involved mechanical system.

sample measured 8 micro-inches. Calculation indicated the reading should be five. Vibration measurements showed a dominant frequency which, by elimination, was associated with the ball bearings in an idler pulley. Precision bearings were installed and the profilometer reading dropped to about five.

6. Sometimes resonant effects are achieved by chance which would be difficult to accomplish intentionally. A fly cutter on a Bore-Matic produced a badly chattered surface. The quill was observed to vibrate perceptibly when idle. The excitation, which just happened to be the resonant frequency of the quill, was due to mechanical vibration from the pump. Rubber isolation completely eliminated the chatter.

7. A boringhead with ball bearings produced an 8 micro-inch surface, which was satisfactory, but the appearance was not good. Measurement and calculation showed the front bearing to be the source of excitation. A better quality bearing reduced the profilometer reading to six, and the chatter marks could not be seen in ordinary light.

8. The final example is one which was not simple and which was solved by intuition. Two boringheads, mounted on a bridge, bored surfaces which were satisfactory in appearance. However, profilometer readings on the sides were three micro-inches greater than those on the top and bottom. A vibration analysis was made but this gave no clue to the cause. The idlers and belts were changed; the work support was stiffened; the speed was changed; the tools were changed; the table speed was changed; the heads were replaced. Though the magnitude was changed, the relative surface finishes remained the same. An attempt was then made to determine resonant effects but this yielded nothing. It was reasoned that the bridge must be different elastically in the horizontal and vertical directions and a new bridge was taken from stock having greater horizontal rigidity. This solved the problem. The difference in the two surfaces was due, probably, to a component of chatter with a peak-to-hollow amplitude of 9 millionths of an inch.

These examples illustrate progress; show that a fair start has been made. It is unfortunate however, that knowledge of vibration troubles is not yet sufficient to analyze all of them nor to solve those that have been resolved into problems. Someday it may be possible to set up a network, equivalent to that used to solve electric transmission line problems, from which a machine tool can be designed and built correctly the first try.

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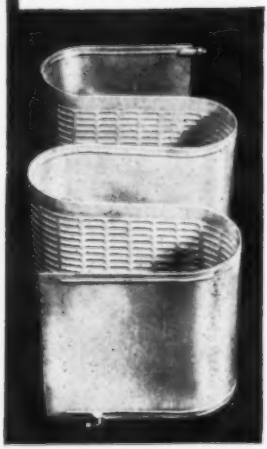

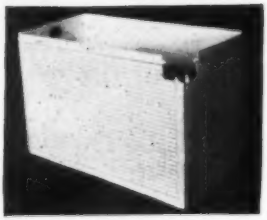

The serpentine shaped plate above makes an efficient refrigerating unit for a four-can ice cream cabinet. Square one below is for a deep-freeze unit.

SEVEN Federal 75 KVA press type spot welders and two Federal 150 KVA seam welders deliver close to a million spot welds and some five miles of seam weld weekly to produce thousands of feet of Hubbell-Yoder Refrigeration Plate, at the Cleveland plant of The Yoder Company Fabricating Division.

These patented plates make deep storage cabinets, refrigerator cars and trucks, ice cream cabinets and frozen food lockers easier to produce, cheaper and more efficient. They are typical of the many useful products which can be manufactured on a practical production basis only because of the indestructible type of fast automatic fabrication that is natural to resistance welding.

Although similar production can be automatically fed, these plates are hand indexed because of the variety of sizes and shapes involved ..from ten to thirty inches wide, two to ten or more feet long. Two sheets of cold rolled steel are used, one perfectly flat, the other press-embossed with interconnected vertical and horizontal channels. The two sheets are welded together with spot welds, using three-quarter inch electrodes, located at alternate ends of the flat rectangular areas between channels. Edges and ends are seam welded. Some of the larger plates have more than 2200 spots and 25 feet of seam weld. These must be high quality welds, air tight, tested to 200 pounds pressure. The plates must

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RIGHT ABOVE . . . A similar roller table is used with the Federal seam welder. About twenty-two feet of weld around this plate. When Infra-Red-Baked finish is applied to the plates the welds are not discernable.

AT RIGHT . . . A few of the many variations in shape of The Hubbell-Yoder plates are shown in this view of the shipping department of The Yoder Fabrication plant.

withstand twisting, right-angle bending, extreme temperature change and in some cases considerable tossing around.

Standard Federal welders and equipment are used in this production. The same installations can be used for an endless variety of ordinary or unusual fabrications, some of which might be yours. It is worth while to remember that resistance welding may well be the answer to some cost cutting problem in your production . . . that Federal engineers are available to help you find out . . . that in resistance welding the name of authority is

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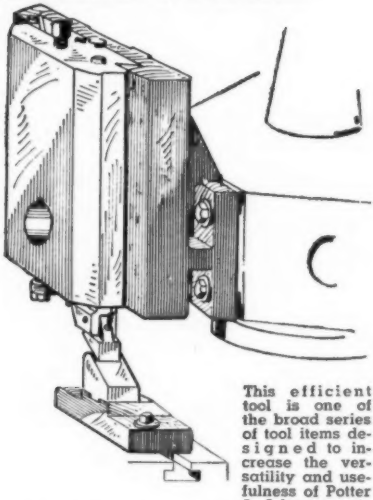

This vertical slide tool is designed for the special purpose of cutting a recess in an internal diameter at any predetermined location. The shaped cutter is carried by a bar held in the hole of the slide. When the cutter reaches the proper location, at end of turret movement, the slide is raised by a cam block carried on the cross slide of the machine and makes the cut while the turret feed dwells at that point. When the cut has been made to desired depth, the cam block releases slide and cutter drops down to its original position.

This efficient tool is one of the broad series of tool items designed to increase the versatility and usefulness of Potter & Johnston automatic turret lathes.

This tool is also used for taper boring, taper turning or crown turning, such as on pulleys, etc. When used on work of this kind, the tool slide is actuated by means of a former plate or cam fastened to cross slide base or to bracket on overhead pilot bar.

This tool is carefully designed and constructed for its special purpose, with rugged proportions adapted for accurate cuts.

Detailed dimensions and specifications are included in this helpful new catalog. If you use Potter & Johnston machines, many of the new tools illustrated and described will help you to reduce costs and speed production. May we send you a copy today — no obligation?

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TOOL ENGINEERING AND PROFITS

By RALPH E. FLANDERS*

A manufacturing business starts out with a product to be made, whose design and materials are presumed to have been established before manufacture is considered. The tool engineer has had something to say about designing and materials.

You first decide on the sequence of operations by which the parts of your product shall be produced. This in turn determines your plant layout if the plant is being tailored to the product and involves as well, the equipment for moving the parts from operation to operation. In this initial problem, you have to consider what is most profitable. What is the expected scale of operations? If small, the plant layout will be simple and the handling of the parts will be by the most obvious means. If large production is contemplated, you will go into such refinements as will give the lowest cost of production for the rate of production that is in prospect.

Selecting Production Machinery

The same judgment will be applied to the next item on your program, that of selecting the production machinery. If the planned-for volume is small, you will use to a large extent standard machine tools. If on the other hand the expected production is very great, you will in many instances be justified in designing or having designed and built completely s p e c i a l productive machinery.

One difficulty is the limited usefulness of completely special machinery for products subject to style changes or for any product which is liable to meet competition from the improved designs of competitors. Care should be taken lest the investment in completely special machinery be so great as to result in heavy losses when design changes are forced upon you.

In view of this danger an intermediate policy can sometimes be followed. This policy employs standard basic production tools equipped with highly specialized fixtures and cutting tools, which alone have to be discarded when design changes are required. An example of this in the field of metal turning would be the Fay Automatic Lathe and other machines of similar type.

Use of Fixtures

This brings us to the subject of fixtures which are used not only on this s e m i-special machinery but also on standard and special. In fact, in interchangeable manufacture on almost any scale production, the fixture is an essential. It saves time and therefore cost in holding the work in the machine. It enables the work to be held firmly in the proper position and without distortion, and this can be accomplished by a workman who has had only a few days or even hours of training. The highly skilled workman would otherwise be necessary. A well designed f i x t u r e therefore saves time, lowers cost and increases production. Bear in m i n d, however, that the elaboration and consequent cost of the fixtures must bear some proper relationship to the cost of the operation and the value of the parts produced.

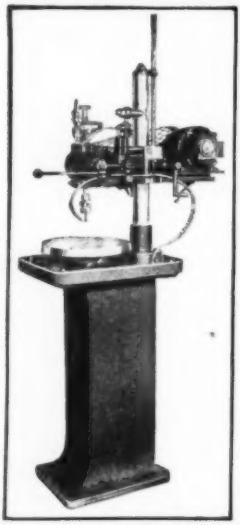
What has been said about fixtures is, of course, equally true with regard to jigs. There is an added importance in the case of the jig, in connection with accuracy since it is often the case that satisfactory duplication of accuracy in even small volume production is well nigh impossible without jigging, except with such expensive machines as the jig borer and such highly skilled and highly paid operators as the workman must be who runs a jig borer skillfully.

• • •

*This article is made up of excerpts from a speech made recently by Ralph E. Flanders, Pres., Jones & Lamson Machine Co., and Bryant Chuck Grinder Co., before the American Society of Tool Engineers.

Precision . . . .

TAPPING



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Another important field for ingenuity and judgment is found in the design of dies for producing sheet metal parts. The field here is interesting and limitless. When quantity production is in prospect not only should skilled attention be given to the production of the sheet metal parts, but consideration should also be given to stamping and forming out of sheet metal or drop forging many parts which are machined from rolled stock where lower volumes of production are contemplated.

After the determination of the processes, mechanical equipment, jigs, fixtures and dies, comes the important question of cutting tools. Progress has been both in the design of the tools and in the material of the cutting edge. The various carbides have undergone a development which has begun to revolutionize machine shop processes. The effective use of carbide tools in any progressive production plant will hereafter dominate the determination of processes, the selection of equipment and, through its influence on feeds and speeds, determine the amount as well as the kind of production equipment.

Cutting Fluids

Twenty years ago, few of us realized that there could be much more to be said about cutting fluids. We knew that they cooled the cutting edges of the tools and in some mysterious way "lubricated" them in such fashion that a smoother finish was obtained. For some things a water soluble compound seemed best, for others a cutting oil, while for many we used nothing at all.

It was customary to put a little sulphur into oil used for thread cutting. This seemed to produce results, but we more or less laughed it off as being half experience and half superstition. Had we nevertheless examined this situation more carefully, we would have discovered that the cutting fluids operated in a much less simple and really a complex way and that there are hitherto undiscovered possibilities in cutting fluid development.

A case in point has been the compounding of special oils for thread grinding, where it is not the physical characteristics of the oil which alone

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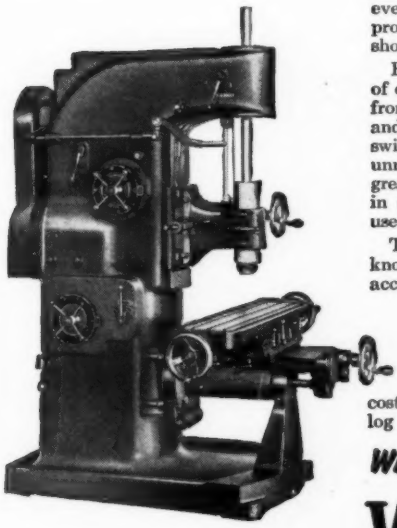

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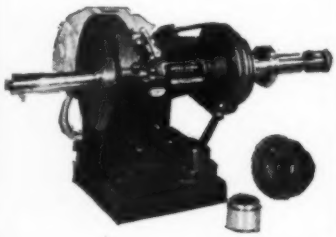

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determines its ability to keep the wheel free-cutting and produce a good finish, combined with a high rate of metal removal. It is the chemical composition of the oil that really counts. Various chrome compounds added to the oil produced mysterious improvements in much the same way that the old fashioned addition of sulphur for thread cutting used to do and still does.

Fifteen or twenty years ago, the tool engineer would not have been worrying about inspection, except to make sure that his preceding work assisted in producing parts which would pass inspection at a minimum cost. Now, however, he is concerned with inspection methods themselves. He has to design various types of special gauges and gauging fixtures and even, where volume of output warrants it, automatic inspection machinery.

Welded Jigs

War production has made us acquainted with assembly jigs, particularly in parts which are to be electrically welded into a complete unit. For airplane frames and other war material, these assembly jigs were often of considerable size and elaboration and were of the greatest importance, both in reducing cost and increasing output. Our war experience will indicate new peace time possibilities for this combined use of assembly jigs and electric welding.

Tool Engineer's Field Expands

All of this indicates the expanding field of the tool engineer in playing his important role of reducing costs and increasing output. This role is indeed so important that on occasion it slips over the boundaries of production problems into the area of engineering design—much to the annoyance at times of the engineering designers. One of the subjects on which the designer may well give heed to the tool engineer is on the subject of dimension tolerances. Few engineers, whether engaged in designing or production, have a clear idea as to the theory of tolerances. The maximum-metal side of the tolerance insures interchangeability. It makes sure that the parts can be assembled freely if they are to be put together

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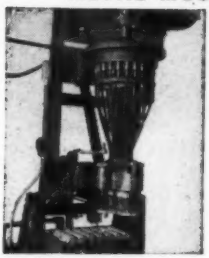
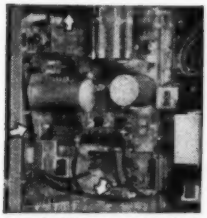


S.S.White flexible shafts as spindles in this machine, solved the problem of drilling up to 38 holes simultaneously in many different hole arrangements.

Problems involving the transmission of rotational power come up all the time in engineering design. And to many of them the simplest answer is an S.S.White flexible shaft—a single mechanical element that will carry rotational power between practically any two points, regardless of turns, obstacles and distance. Likewise, you will find S.S.White flexible shafts the answer to hundreds of mechanical remote control problems.

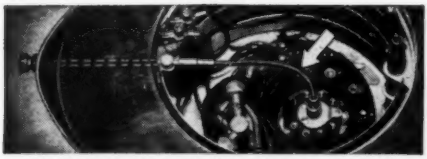
A few examples are shown of the kind of jobs for which S.S.White flexible shafts are ideally suited.



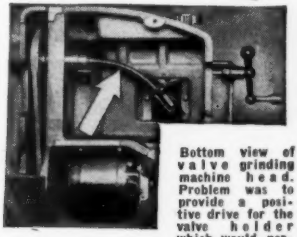
View inside a radio broadcast transmitter shows how S.S. White flexible shafts provided centralized control while allowing tuning elements to be mounted in the most favorable circuit and wiring positions.

WRITE FOR BULLETIN 4501

It gives essential facts and engineering data about S.S.White flexible shafts and their application.



In this unit (cover removed) the problem was to provide a means for operating a rotary switch from a convenient outside point. As can be seen, an S.S.White flexible shaft neatly does the trick.



Bottom view of valve grinding machine head. Problem was to provide a positive drive for the valve holder which would permit three-way adjustment of the holder. An S.S.White flexible shaft was the simple answer.

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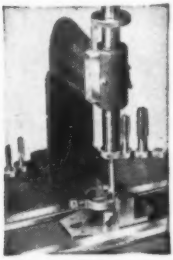

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by hand, or with the proper degree of pressure if they are to be force-fits, or with proper allowance for lubricant if they are to be running fits. The minimum-metal tolerances on the other hand make sure that the looseness is not too great for serviceability. The margin left between the maximum- and minimum-metal dimensions determines by its amount the degree to which high production and low cost can be attained.

The tool engineer often struggles for high production and low cost with close tolerances which he is sure are justified. A heart to heart conference with the designing engineer will sometimes indicate that he is at least part way right. Sometimes dimensions have been set so close that the inevitable result was low production and high cost. In such cases, consultation with the tool engineer may indicate that more or less redesign is necessary to avoid the necessity for these expensive close tolerances.

Tool Engineer and Design

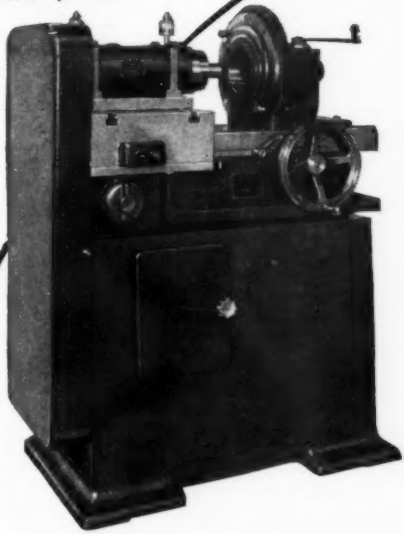
This brings us to the point where the tool engineer often has something useful to say about the design of the product as well as its dimensioning. By bringing together the designing and production engineers at the closing stages of the design and at the beginning of production planning, highly useful changes can often be made in the proposed production. The tool engineer can offer useful suggestions on alterations, often minor, which will minimize machining, make for accurate, rigid holding in fixtures and provide for register points which will assure that separate operations are kept accurately in line with each other.

Tool Designer Important

The tool designer thus plays a major part in producing a large volume of serviceable, useful products at low cost. He is responsible for so organizing production that the desired volume and quantity of output can be obtained by the transfer of the skills of mechanic and tool maker to jigs and fixtures, which can be used by semi-skilled operators. The tool engineer is indeed at the center of our industrial system. As

SIMPLEX

There are many simple precision boring operations best handled by a simple machine which is applicable to a variety of work and can be operated by relatively unskilled labor. This type of machine permits adjustments and maintenance by the operator thus conserving the limited supply of skilled help for those places where it is really essential. Precision is built into the machine; design of the fixture makes loading and unloading easy for the operator; investment is low justifying its use on small production quantities.



The SIMPLEX No. 2B Precision Boring Machine shown is equipped with No. 3 spindle and a multiple step locator type of fixture for mounting three sizes of motor end shields for precision boring bearing holes in accurate concentricity with the rabbet. A quick-acting clamp operates two hook bars which both seat and eject the piece mechanically so that loading and clamping is very fast and positive and ejection equally fast and positive. Micrometer eccentric adjustment of the tool makes for extreme accuracy in addition to concentricity and squareness desired.

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Detailed information regarding principle of operation, method of attachment, and use of a new, simplified duplicating unit for machine tools are covered in an 8-page bulletin No. (CC-2), "Bailey Duplicating Attachment for Machine Tools" issued by Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio. Like the original contour control announced by Bailey in 1944, it is a combined air and hydraulic system which may be attached to engine lathes, turret lathes or vertical boring mills to produce work pieces with contours which exactly correspond to a thin metal templet or master part.

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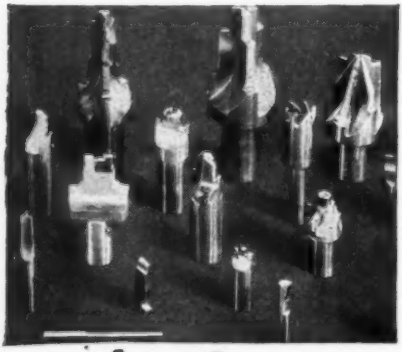

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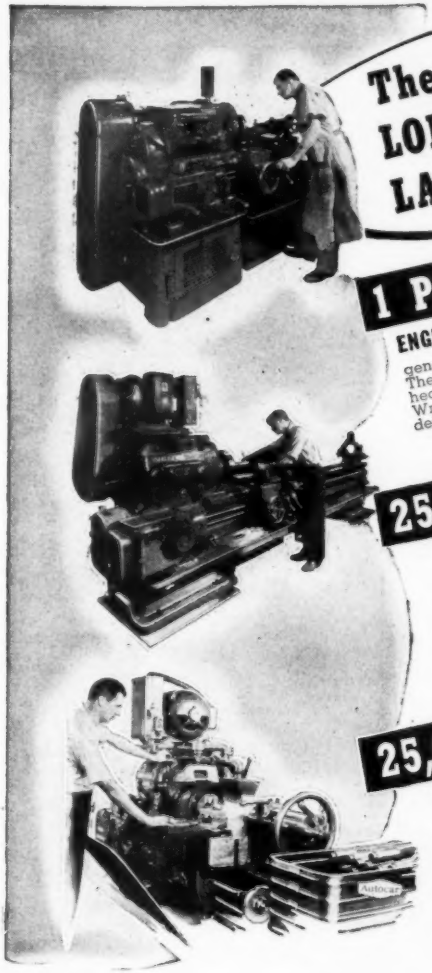

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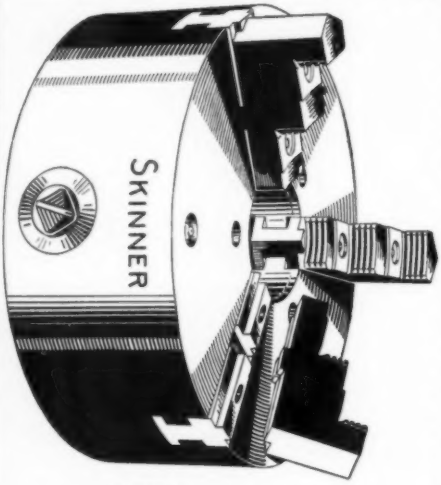

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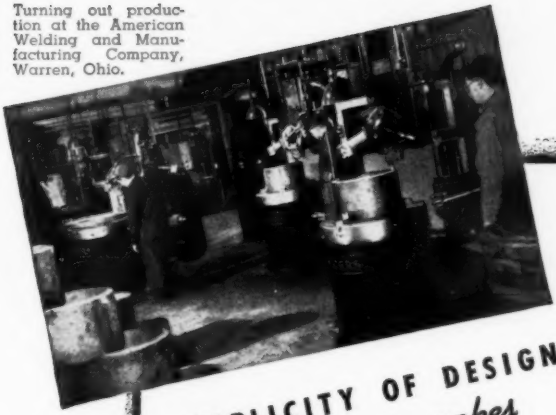

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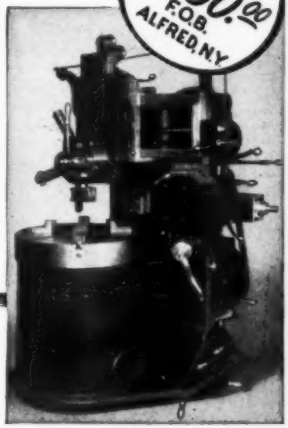

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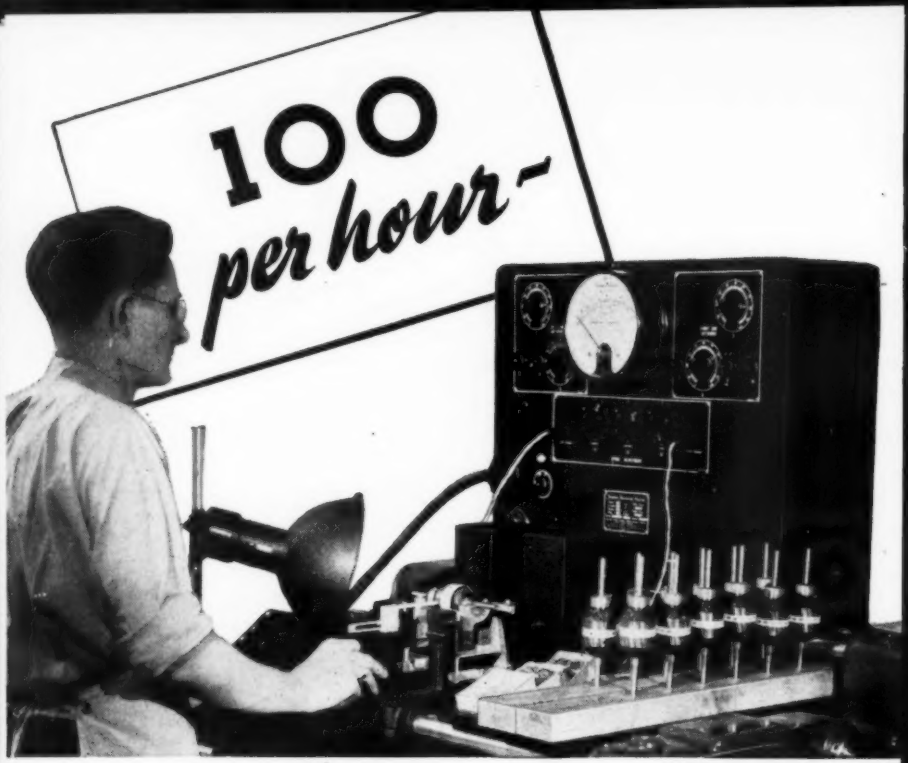

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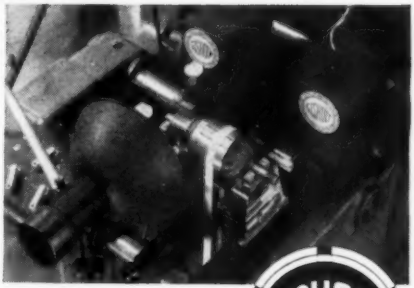

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Industry Report On Standardization

By A. P. O'NEILL*

CRITICISMS have been voiced against the standards being established for machine tools; these on the premise that such standards will retard future development. The feeling that exists in general however, is that these standards will cause the design engineer to probe deep and to procure all details before attempting the design of a machine tool. With these standards as a guide the design engineer will know a great deal more about what is expected in the way of performance in the field.

Many Changes Made

There have been a great many changes made since the original draft. For example, at the meeting held on June 29, 1945, there were 56 alterations made. Most of these only involved a slight change in the wording—in an effort to further clarify the meaning.

There are however, a few in which there might be more than a little interest. One is 2.6.2. which concerns the mounting of the control enclosure. This originally stated that the control panel was to be at least two feet above the floor. There was some confusion as to whether this meant the panel or the enclosure. It was changed to read, that the **Enclosure** must be two feet or more above the floor. There has been plenty of controversy over this particular item which was specifically written to prevent the installation of control panels at floor height in the base of a machine. If one like that could be seen about a year after it had been in use in a cylinder block or a piston department, it would be hard to understand why it had not blown itself out on the floor. Safety of the repairman who, in order to work on an installation of that nature, is compelled to lie on the floor with his legs extending into the aisles where there is danger of being hit by material handling trucks is another reason for the change. Several instances of accidents could be cited to support this change.

Paragraph 2.6.4. now reads as follows: "All control equipment such as limit switches, brakes, solenoids, push button stations, etc., shall be mounted in a rigid, readily accessible manner in a reasonably dry and clean location free from the possibility of accidental operation by normal movement of the machine or the operator, protected so that it cannot be operated by accident, and with enough clearance from surrounding surfaces as to make removal and replacement easily possible. All limit switches shall be applied so that accidental over-travel will not damage them. Solenoids for use in oil are acceptable."

Safe Electrification

Here again an endeavor has been made to make the electrification as safe as possible for both the operator and the machine. If the wiring and the control units are kept clean and free from dirt, compounds which carry iron dust, and etc., there is little likelihood of them being inoperative due to short circuits at a time when they should be operative. The last sentence: "Solenoids for use in oil" was added at the June meeting to allow for hydraulic jobs where many solenoid valves are designed and built to operate in the hydraulic fluid without trouble.

Paragraph 3.2.3. concerns special motors. It should be easy to understand that a large industrial plant using from ten thousand to thirty thousand motors must necessarily carry quite an inventory of spare motors. This would still be a very large item if nothing but standard foot mounted motors with

• • •

*From a paper presented by A. P. O'Neill, Assistant Plant Engineer Pontiac Division, General Motors Corporation, Pontiac, Mich. at the Machine Tool Forum held at Westinghouse Electric Corp., Pittsburgh, April 9

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standard dimensions were used throughout. It would be necessary to carry, for spares, at least 5% of the total in operation. Now if only twenty per cent of the total were special motors. such as flange mounted, core fitted stators, gear head, double end shaft, special long shaft, new N. E. M. A. dimensions, sleeve bearing, motor mounted brakes, torque motors, and etc., you can readily see the inventory of spares jump from 5 per cent to 8 per cent or 10 per cent of the total in use. The industrial plant is built and operated for one reason—profit, and there can be no profit from idle motors. The plant engineer and the electrical engineer do not have the time to physically check every machine that comes into the plant. So it becomes very embarrassing when some day or night a machine tool is found out of service because a little ½ hp. flange mounted motor, hidden in the base of the machine, where no one ever saw it before, is burned out and there is no spare for it. Therefore, it is suggested that the use of such special motors be approved in writing if they must be used.

Motor Compartment Size

There have also been lengthy arguments about paragraph 3.3.3. which governs the size of a motor compartment in a machine. It would be interesting to see the designers, of some of the past model machines, trying to remove and replace a motor while the superintendent was fuming and fussing about the line being down. Compartments have been so relatively small when compared to the motor, it is not possible to believe the motor could be installed. It would be a real pleasure to see the designer trying to make and tape the connections at the motor after it is in place. What usually happens is that the wires are installed with enough length that the connections may be made out on the floor before installing the motor. This method leaves long loops of wire lying on the floor of the compartment without mechanical protection or protection from oil, water and dirt. Wires have also been seen in such installations that had slipped under the motor foot and were clamped there when the motor

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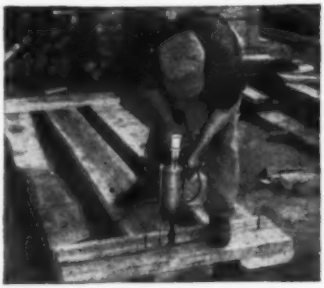

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bolts were tightened. The consequence is shortly a ground that is very hard to locate.

Motor Protection

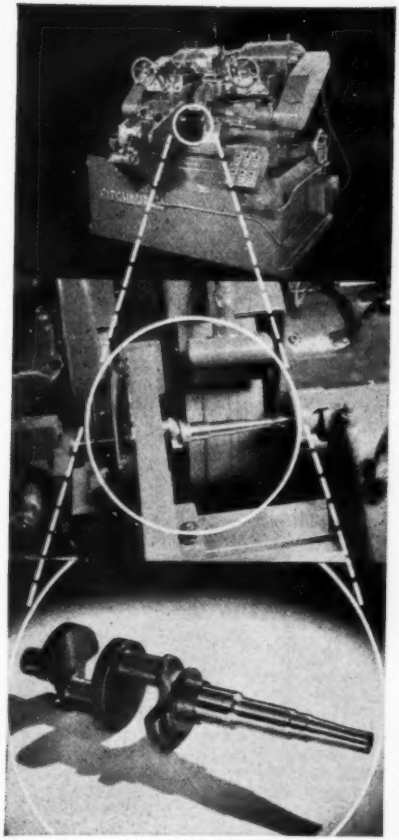
The paragraph 3.3.4. was designed to protect the motor from outside influences. It might be felt that as the enclosed motors have been standardized upon this might be an unnecessary precaution. However in practice it is very necessary. In the case of a fan-cooled motor, considerable air is forced through the cooling ducts and naturally any dirt or oil vapors in the vicinity go with it. Soon then, the ducts are filled with dirt which makes a good blanket to keep the motor warm. All plants still have some open motors in service and some grinder builders still insist on sleeve bearings which usually means open motors, and dirt is not good for these.

Synthetic Wire Insulation

In paragraph 4.2.3 the popular synthetic insulation for wires is defined. During the war, some very sad experiences with some of this insulation occurred and as a result, the industry was about to condemn it entirely when it was discovered there were a number of different grades available.

A change was made in 4.5.4. Originally the maximum size solenoid allowed without the use of a relay was specified in pounds pull. As there is interest only in the volume of current passing through the contacts of the activating medium, this was changed to a current rating.

4.6.3. on liquid tight flexible conduit and fittings. Flexible conduit has been one of the biggest contributors to the electrical maintenance man's troubles. The machine tool builders used about the only thing available; Greenfield and similar material. However, it was used where it was not necessary and some even completely wired the machine with it. This was bad as oil, cooling compounds, etc., seeps through the joints and then flows inside to the lowest point at which quite frequently is located some of the operating apparatus such as limit switches, push buttons, starters and etc. On three out of every ten machines wired with this material,



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at least one connection will be found which has been pulled off and the conduit frayed out. Several manufacturers are now working on the development of a strong moisture proof flexible conduit. The N.M.T.B.A. Committee has a good knowledge of what has been done along that line.

Make Changes Quickly

It has been found that many of the machine tool builders are recognizing these factors and making an effort to profit by the experience that has been gained through the usage of their products. Since the war, machines have been received, the motors for which have been removed from the cubby hole in the base of the tool and mounted on a bracket attached to the back of the column; this is a good practice. A machine was seen on the receiving dock the other day with moisture proof flexible conduit running to a movable head that was a very good looking job. Of course, all builders cannot change their entire line overnight or maybe not in a year. However, it is hoped that the machine tool builders will not use these difficulties as an excuse to prolong the changes required.

Help for Tool Builders

The committee was organized with the hope that it could be of help to the tool builder in the attainment of better quality in the electrification of machine tools. The goal is electrification that will operate under the most severe conditions throughout the entire mechanical life of the machine. This can be and has been done. The combined experience of the men who worked on the development of these standards amounts to well over 500 years. Many of them have grown up with the industry all the way from the old line shaft days and it is felt the machine tool builders may just as well have use of the knowledge gained in all this experience. We definitely wish to work with the N.M.T.B.A., the N.E.M.A. or any other group whose desire it is to help produce better electrification for machine tools and to make the job of maintaining the machine a minor one rather than the major job it has been in the past.

Here's a fast, economical method for cutting high quality Embossing Dies!

Courtesy Cadillac Stamp Co.

GORTON 3-Dimensional Pantograph Rough and Finish Cuts Die for Stamping Aluminum Bottle Caps at One Setting in One Hour

This large eastern manufacturer recently received an order for a die for embossing aluminum milk bottle caps. Nothing like it had been cut prior to the order so no set procedure had been established.

The job was tooled up on several machines in an effort to find out which would produce the most satisfactory results in the least amount of time. The outcome was definite and decisive. Of the machines used, the Gorton 3L Pantograph gave the best performance. Not only did it turn out the best die but turned it out in the record time of one hour.

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Gorton Pantographs have no equal in the performance of intricate milling and engraving operations. They can be used for the profiling of grooves, contours and other shapes; for the cutting of dies and moulds; for engraving numerals and designs in any machinable material; and for numerous other purposes. A special roll attachment makes it possible to work from a flat master or model around rolls, dies, knurls up to 6" in diameter. Gorton Pantographs are available in two and three dimensional models to handle many sizes and types of work.

Consult Gorton Engineering Service

Perhaps some of the work at which you are now engaged could be accomplished better, faster and with greater economy on a Gorton Pantograph. If you will submit detailed prints of your job to Gorton Engineering Service, our engineers will thoroughly investigate the possibilities and send you a complete report of the results. This service is offered free and without obligation.

JOB FACTS!

NAME OF PART—Milk Bottle Cap Embossing Die—Used in the manufacture of aluminum milk bottle caps.

MATERIAL—Tool steel—hardened and chrome plated after.

MACHINE—Gorton 3-Dimentional Pantograph, Model 3-L.

OPERATIONS—

1. Rough within .001"; depth .008"; speed 2300 r.p.m.
2. Finish in one cut, depth .001"; speed 2300 r.p.m.

TIME—One hour.

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For complete information on the Gorton Pantograph, write today for Bulletin No. 1655.

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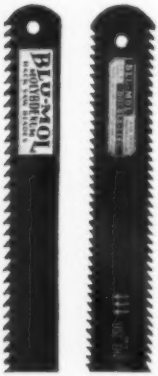

1. Improves the accuracy of cut.
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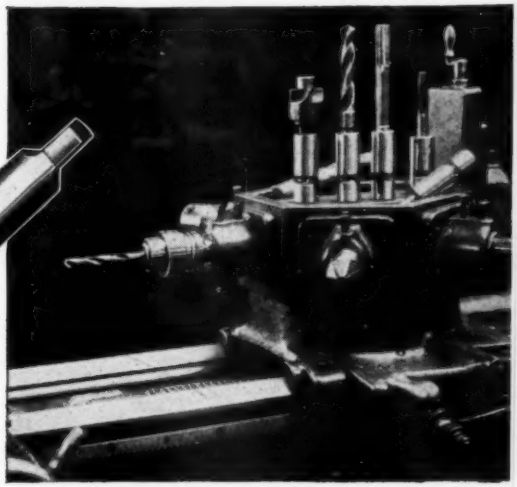

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- UNIVERSAL CHASER GRINDING FIXTURES

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In effect, Modern-Magic Quick Change Chuck and Collet Equipment makes available as many extra turret stations as are needed. The tools being inserted and removed, one after the other, to take care of each extra operation.

With Modern-Magic Quick Change Chuck and Collet Equipment, tool changes are quickly and easily made. Production is stepped-up and cost reduced.

For complete information covering Modern-Magic Quick Change Chuck and Collet Equipment, send for Bulletin No. M-101

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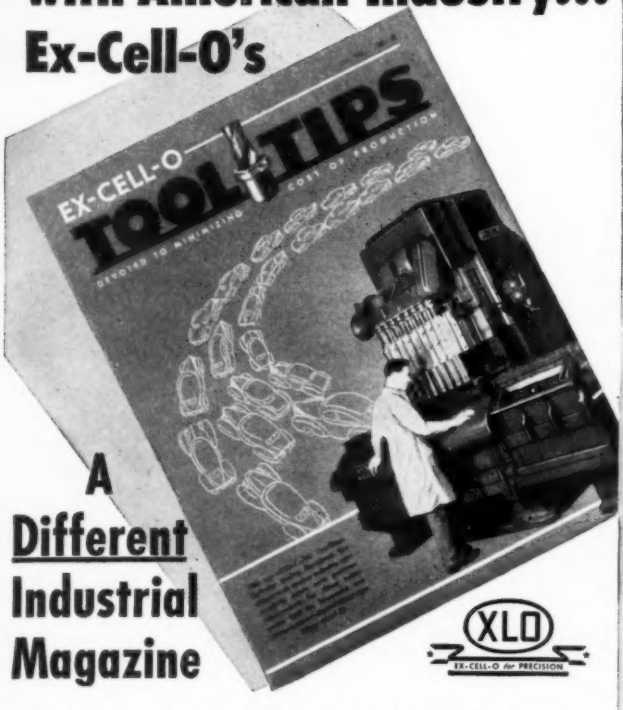

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Tool Tips, published regularly by Ex-Cell-O since 1925, is "devoted to minimizing the cost of production". Every issue contains a variety of useful hints to help you produce more accurate parts at lower unit cost.

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$200,000 "Design-for-Progress" Award Program

Offered Metal Working Machinery Manufacturers By Lincoln Foundation

AN exceptional opportunity for those engaged in the design, manufacture or construction of any type of metal working machinery or parts, is offered by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, in the announcement of their new $200,000 "Design-for-Progress" Award Program.

"Metal Working Machinery" is admitted in two divisions of the "Functional Machinery" classification: (1), Metal Cutting Machinery, or Parts, and (2), Metal Forming Machinery, or Parts. "Machinery" maintenance workers may also enter the competition under the Program's "Maintenance" classification.

Eight awards, totalling $3,200, established for these two divisions of the "Functional Machinery" classification are: Division 1, 1st., $700; 2nd., $500; 3rd., $250; 4th., $150; Division 2, 1st., $700; 2nd., $500; 3rd., $250; 4th., $150.

Papers in these two "Metal Working Machinery" divisions are also eligible for the "Functional Machinery" classificational awards of: Classification $2,-500, $1,500, $1,000, $800.

Three winners of divisional and classificational awards will also be possible recipients of the main program awards of $10,000, $7,500 and $5,000, respectively. The principal program award, which may be won by a paper in the "Functional Machinery" classification, is $13,-200.

An author entering his paper in either of the above divisions of the "Functional Machinery" classification, not winning any other award, may still win one of the 217 honorable mention awards of $100 each.

To assure equal opportunity in the "Design-for-Progress Award Program", awards are offered in each of the fifteen major classifications which are: Aircraft, (2 divisions); Automotive, (2 divisions); Containers, (2 divisions); Furniture and Fixtures, (2 divisions); Functional Machinery, (6 divisions); Industry Machinery, (6 divisions); Personal Service Machinery, (6 divisions); Railroad, (2 divisions); Structural Buildings and Bridges, (2 divisions); Structural Houses and Miscellaneous, (2 divisions); Watercraft, (2 divisions); Welderies, (2 divisions); Commercial Welding, (2 divisions); Maintenance, (2 divisions); and Research and Education, (3 divisions).

The 452 awards for the entire program are grouped as follows:

A total of 172 divisional awards—First, Second, Third and Fourth awards of $700, $500, $250 and $150, respectively, in each of the 43 divisions.

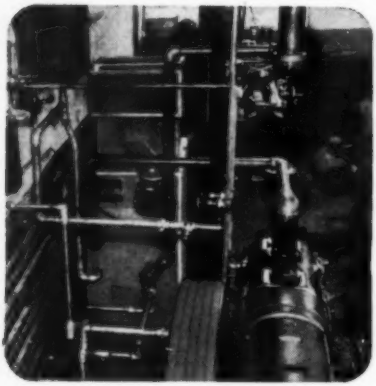
A total of 60 classification awards—First, Second, Third and Fourth awards of $2,500, $1,500, $1,000 and $800 respectively, in each of the 15 classifications.

A total of 3 main awards — First, Second and Third awards of $10,000, $7,500 and $5,000, respectively.

A total of 217 honorable mention awards of $100 each for 217 papers which do not share in any other award but deserve honorable mention in any of the divisions.

The 172 divisional awards will be determined first and from them will be selected the 60 papers to receive the classificational awards. These, in turn, will be judged to determine the three main awards of the program. After all divisional, classificational and main

Niagara Aero After Cooler Protects Air Processes from Moisture Damage



Industries requiring dry compressed air need the Niagara Aero After Cooler. It provides cleaner, drier air for pneumatic tools, spray guns, sand and shot blast equipment, air cleaning nozzles and situations where air is introduced into materials in process.

The Niagara Aero After Cooler is based on the evaporative cooling principle. It does not consume cooling water and thus pays for itself quickly from savings in water bills. The patented "Balanced Wet Bulb" method assures the lowest air temperature, and controls exactly the jacket water temperature.

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awards have been determined, papers will be selected to receive the honorable mention awards.

The $200,000 "Design-for-Progress" Award Program, which is intended to encourage study and preparation of papers on design, research and education, application and use of arc welding, is dedicated to the belief that it will benefit industry as a whole. For this purpose, the sponsors will make the results of the program available generally and, thus, tend to stimulate industry to greater achievement.

The current activity is the sixth award program to be conducted by the Lincoln Foundation during the past several years which include the recent "Undergraduate Award and Scholarship Program", "Award Program for Textbooks on Machine and Structural Design", and "The Agricultural Award and Scholarship Program."

The current award program typifies the consistent activities of the Lincoln Foundation which included the awarding of cash amounts to writers of winning papers on the preparation of textbooks, on farming, and on practically all types of commercial and industrial progress involving welding. The Foundation has also established special collections of books on the arc welding process in engineering schools and published books on welding in design, manufacture, construction and maintenance.

Complete details of the $200,000 "Design-for-Progress" Award Program, which closes June 1, 1947, may be obtained by writing the Secretary, The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

NEW HELI-COIL SCREW THREAD INSERT

"Heli-Coil System for Replacing Stripped Threads," is the title of Bulletin 300 issued by Aircraft Screw Products Co., Inc. 47-23 35th Street, Long Island City 1,, N. Y. It contains illustrated instructions for installing Heli-Coils in tapped thread repair work, as well as specifications and part numbers of the accessory tools recommended for use with Heli-Coil Inserts for American National and spark plug tapped threads. A copy may be obtained by writing to the Company.

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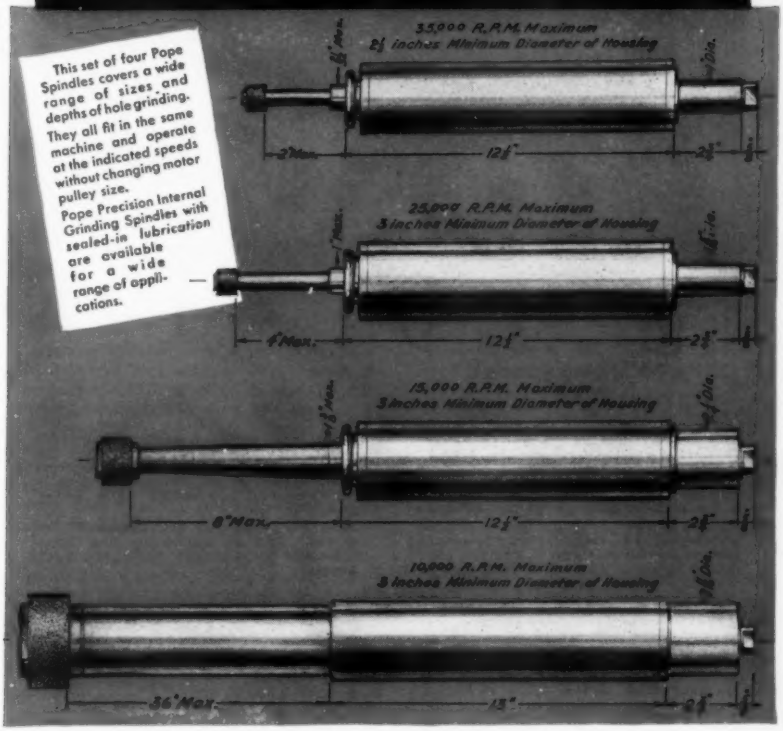
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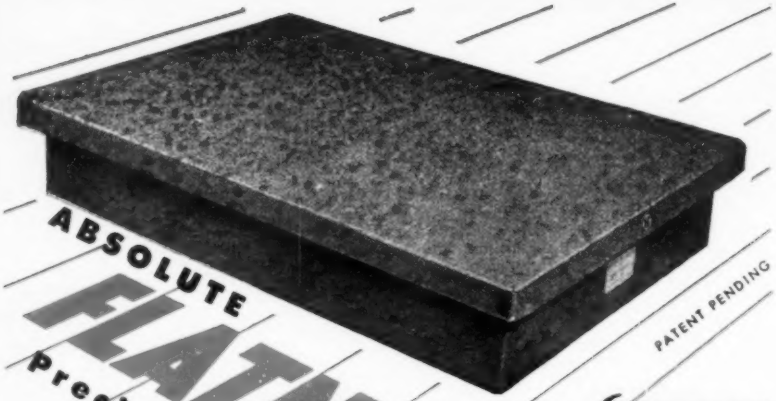

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Removing Broken Tools by CUTTING AWAY CORES

A NEW method of removing broken or wedged tools by cutting away the cores of the damaged pieces without disturbing or otherwise affecting the metallurgical qualities or dimensions of the surrounding parts has been responsible for cutting salvage losses from this source to a minimum in busy factories.

Aluminum castings, motor shafts, cylinder blocks and many other highly specialized manufactured parts, slated for the scrap heap because of broken or embedded drills, reamers, pilot gages etc. have been restored to usefulness thru use of a method which, while it permits removal of the broken tool in a minimum of time, operates with a feather touch.

This method permits removal without distortion in any way of the threads or the hole itself and, what is equally important, without affecting the temper of the basic part. Further, removal is accomplished without specialized personnel and without complicated equipment. A drill press, a water outlet and an electric connection are all that are needed to make the apparatus function.

And tho the applications of this disintegrating process may have formerly been restricted to wartime products, engineers already are at work on peacetime uses of the process, ranging from a speedier method of reconditioning used machines to the manufacture of new parts, thru the operation of the disintegrating principle.

Under the process as perfected by the Drafto Corp., (Walter J. Greenleaf Co., Pittsburgh 21, Pa.) Elox Corp., Detroit, and Electro Tool & Engineering, 9405 W. Fort St., Detroit, disintegration of the broken tap or drill is accomplished by use of a tubular copper electrode, somewhat smaller in diameter than the broken tool it is intended to remove. In the disintegrating process, one element is of outstanding importance, the necessity for centering the electrode on the damaged part.

This is the Elox disintegrator. At the left is the cabinet containing the transformer and the coolant reservoir and pump together with the necessary hose connections. As fixed in the drill assembly (to insure proper alignment with the work) there is the disintegrator head in the center with the electrode directly in front of the operator's hand. The water and electrical connections are visible at the bottom of the drill platen.

In practice it has been found advisable to use a drill press set up wherever possible, since in this way the operator is assured of controlling the path of the electrode so that the metal of the part surrounding the broken tool will not be affected.

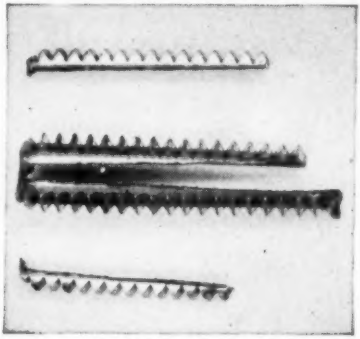
Tho any drill press will serve in centering the electrode on the damaged part, the motor must be disconnected since the disintegrator head does not revolve. Coolant water which flows thru the electrode and the electric current are turned on as the electrode makes contact with the steel to begin the disintegrating process.

Once the task of removal has started, the electrode literally cuts an annular core down the center of the broken tool, leaving in some cases a shell which is easily removed. In other cases, where the dimensions of the broken tool are sufficiently large, a core remains to be picked away after the binding pressure which originally caused the tool to fail, has been released. Complete removal then follows.

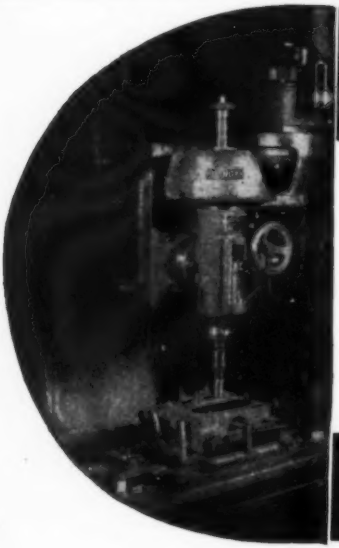
One of the important features of the process of disintegration is the fact that the work remains cool thruout the entire process and there is no danger of heat distortion or electrolytic action.

Each unit includes a cabinet housing the transformer, electrical controls and water or coolant control. The disintegrator heads include cylindrical aluminum cases which contain water cooled solenoids. The spring-mounted vibrating spindle, together with all the fittings, are made of bronze, monel or copper to resist corrosion. Disintegrator electrodes ranging in size from .312 to .048" and flat are also provided with the apparatus for larger work. Additional electrodes in varying sizes are readily available from stock.

In the process of disintegrating wedged and broken tools, two things are of spe-



Disintegration under the Elox system looks like this. Top and bottom are the sections left in the work after disintegration of the center section has taken place. They are easily removed with the simplest of tools without damage to the surrounding threads. The center picture shows how the electrode "melts" down thru the wedged tool.



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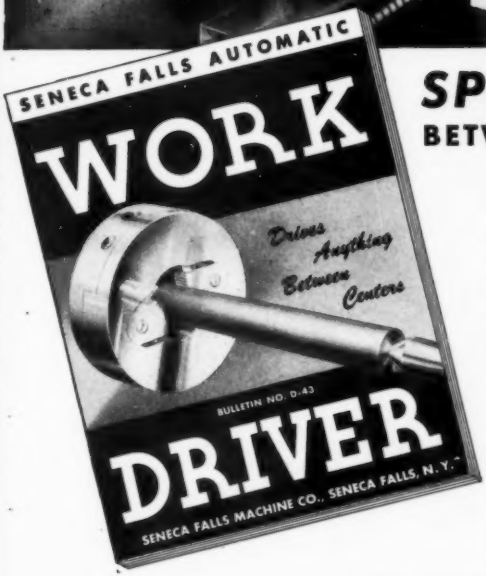

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Now available in eighteen *standardized* models which can be ordered from our new catalog. Write for your copy today and utilize this proven Driver to help speed production.

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LATHE NEWS from SENECA FALLS

Involved and expensive manufactured parts are rescued from salvage piles by use of the disintegrator which, fixed to a drill fixture literally melts away the core of the wedged tool so that it can be easily removed from the part without damage to the surrounding metal.

cial importance—the necessity for correct alignment to protect threads in the completed part and the use of the proper-sized electrode, since it is desirable for best results to use as large an electrode as circumstances permit in the disintegration of the broken tool. The thinner the shell of the broken tool the easier its removal. There are available as standard stock, numerous sizes of electrodes covering a range of taps from 9/16″ and larger to the standard No. 2 tap with an outside diameter of .040″.

The procedure for removal of taps and drills is similar, except that in the case of drills the operation is somewhat slower because of long helical cuttings which in many cases are wedged in the flutes.

After a hole in the wedged tool has been disintegrated, there remains a core which is approximately equal in size to the inside diameter of the hollow electrode. This core may be broken off at

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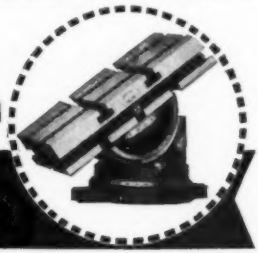

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intervals during the process of disintegration but the final pieces will have to be removed by a magnetic pick or scriber with special care in the operation to prevent damage to threads.

Because there are no flutes or openings in the case of studs, screws etc. a slightly different technique is employed wherein a rectangular shaped electrode is used. When the formed hole has been disintegrated at least half the length of the broken stud, a wrench which fits the rectangular hole can be inserted and the stud backed out. In the case of dowel pins, a round hole is first "spark drilled" in the exposed end of the pin. An "easy out" is then inserted and the pin is withdrawn manually by a mechanical puller.

While the shape of the electrode determines the shape of the hole, the top of the hole will usually run about .008" larger on a side than the bottom at a depth of ½". This is equivalent of .016" oversize on a diameter.

From the foregoing it will be seen that correct alignment to protect threads in the machined work is of utmost importance, since the electrode in its disintegrating travel follows a direct line. Variance would carry the disintegrating process beyond the wedged tool into the threads and walls of the part itself.

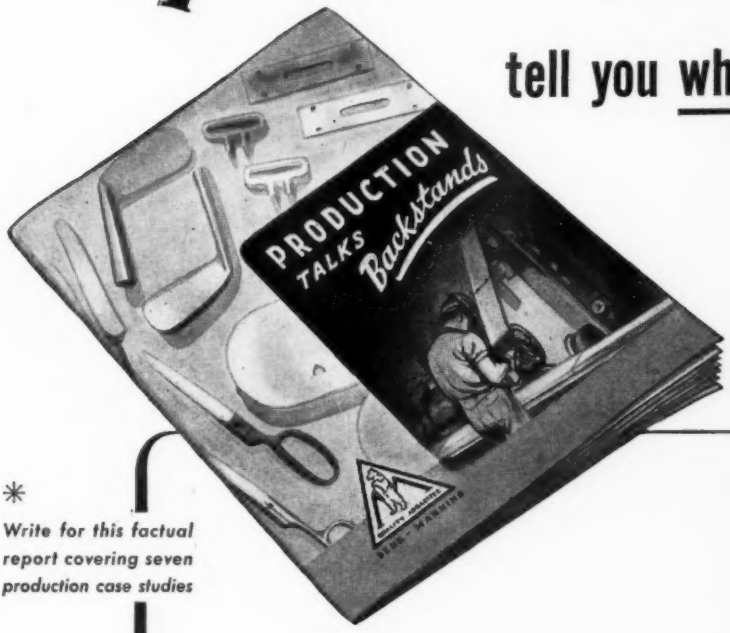
Future development of the disintegrating method undoubtedly is linked with the formation of shaped holes. Since the shape of the hole can be controlled by changing the shape of the electrode, it is apparent that changes in the pattern of the electrode will be developed.

NAILS INTO COLD INGOTS

Employes at the South Chicago works of Carnegie-Illinois Steel Corp. soon will be doing the seemingly impossible, nailing identification tags to cold ingots of the hardest steel.

Not only can nails be driven into cold steel but it can be done with very little effort. A 2¾ pound hammer with a simple spring attachment to hold the specially heat-treated, quarter-inch nail, and metal tag bearing the heat number is all that is required. Furthermore, exceptional physical strength on the part of the man wielding the hammer is not required.

7 Field Engineers tell you why*



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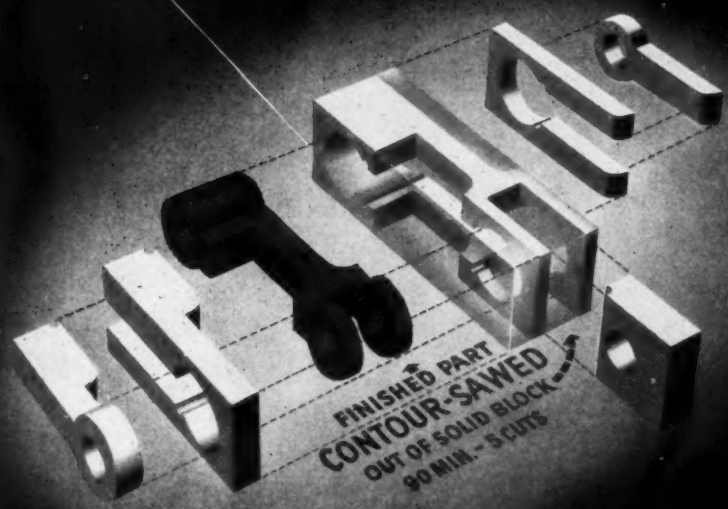

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CONTEST RULES

One prize of $750 for the best paper emanating from an industrial source, consulting engineer, private or government laboratory, or the like, the subject matter of which is concerned specifically with resistance welding. There are no restrictions on the scope of the subject matter. For example, it may be devoted to redesign of a product or products for resistance welding, improvement (from a welding and cost viewpoint) in a present design for resistance welding, resistance welding research, development of new procedures to broaden the field of application of resistance welding, etc. Papers in these categories should explain the economic importance of the accomplishments described—that is, cost savings, production improvement, scope of application, etc.

A prize of $500 for the second best paper in the above classification. A prize of $250 for the third best paper in the above classification.

A prize of $300 for the paper emanating from a university source (that is, either an instructor, student or research fellow) which in the opinion of the Board of Awards is the greatest original contribution to the advancement and use of resistance welding. A prize of $200 for the second best paper emanating from a university source.

OPENING & CLOSING DATES

The contest is open to anyone, without restriction, from the United States, its possessions and Canada. It is also open to any member of the American Welding Society in any grade from any place in the world. The contest is considered as having opened August 1, 1945, and will close on midnight, July 31, 1946. Papers which are to be presented at the Annual Meeting of the American Welding Society in October may also be entered in this contest, in which case a draft or copy of the paper must be filed with the American Welding Society not later than July 31, 1946.

PAPERS PROPERTY OF R.W.M.A.

All papers submitted in the contest become the joint property of the R. W. M. A., and the American Welding Society, who will retain all rights thereto. The American Welding Society will appoint five judges, who will judge the relative merits of the various papers submitted and make the awards accordingly. The decision of the judges will be final.

For the author or authors to be eligible for this award, the paper shall describe clearly original work done by them or under their supervision on resistance welding in any of its aspects by any method or process. The paper shall be a full disclosure of the subject. The paper shall contain no statement which is unethical advertising or sales promotion. The papers may contain statements of fact, including the names of either individuals or organizations of any kind, commercial designations, trade names, etc. The minimum length requirement is 2,500 words.

MECHANICAL DETAILS

All papers must be typewritten, double spacing, written on one side only of blank white paper. Photographs, charts, graphs, etc., may either be attached directly to the copy or may be detached, in which case they should be clearly identified with figure numbers, captions, etc.

Papers entered in this contest should be sent to American Welding Society, 33 W. 39th Street, New York 18, N. Y. If mailed to arrive not later than July 1, 1946, three copies should be furnished. If mailed to arrive between July 1, and July 31, 1946, six copies should be furnished.

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Electrical Equipment For Machine Tools

By G. A. CALDWELL*

DURING the past several years the gradual disappearance of overhead line shafts and belts from industrial plants and the installation of modern individually motor driven machine tools has been watched by many. The large majority of these tools make use of standard squirrel cage induction motors and while the majority of plants still have both a-c and d-c power distribution systems, many of the newer ones have only the a-c system and, therefore, use only 220 or 440 volt, 3 phase, 60 cycle motors. While it is a rather delicate subject to discuss at this time, normally electrical motor manufacturers keep a good stock of these a-c motors on hand so immediate delivery to the builder of the machine tool or to the ultimate user can be made.

Substitution The Old Method

On some of the earlier machines the customary practice was to simply substitute a motor for the overhead line shaft and supply a suitable belt drive from the motor to the machine tool and have the entire machine driven from the single motor. Now the machines have been redesigned for individual motor drive and, while in many cases belt drives are still used, the motor is often directly connected to the spindle or other mechanical parts of the machine. At the present time a large percentage of machine tools are no longer driven by a single motor and on the larger and more complicated machines five to ten motors are not uncommon. While most machine tools use standard a-c motors, others make use of motors that have special electrical or mechanical characteristics and are specially made for that particular machine. In many cases, these motors are part of what may be called a sub-assembly, a typical example being the coolant pump and lubricating pumps which have a small motor built into the pump assemblies.

As the machine is simplified mechanically by applying motors to perform these various functions, it is quite logical to expect the motor to go through cycles of operation that, in the past, have been obtained by means of clutches, gear changing mechanisms or other mechanical and hydraulic devices. In this connection, it seems advisable to emphasize the fact that even with the mechanical and hydraulic drives these in themselves are not a source of power. In every case an electric motor must be used to furnish the power that these mechanical and hydraulic devices distribute to the machine tool after receiving it from the motor shaft.

Wide Speed Range Needed

The most common requirement which results in the use of the mechanical and hydraulic drives is that of a wide speed range. Another requirement is one of automatic cycle of operation where it is desired to operate at several different speeds, usually with changes from one speed to the other at a fairly rapid rate. These functions can be performed with electrical equipment more elaborate and expensive than the squirrel cage induction motor and it is often quite involved to make the proper decision as to which type of drive is ideal for the particular case. The fact that all three of these drives are used today indicates that there is a place for all three types of drives and the actual decision can be influenced not only by the economics of the drive but by the particular experiences of the designing engineers, the shop facilities available in the machine tool factory and many other minor considerations. The decision is not one of using electric motors

• • •

*From a talk before the American Society of Tool Engineers Convention, Cleveland, Ohio, April 12, 1946, by G. A. Caldwell, Mgr., Industrial Control Engineering, Switchgear and Control Div., Westinghouse Electric Corp., East Pittsburgh, Pa.

to drive the machine, but that of using additional electrical equipment that will permit the elimination of mechanical and hydraulic equipment.

Check Before Changing

Before deciding that it is necessary to use special mechanical or hydraulic mechanisms to perform certain functions on machine tools, it may be found that even the squirrel cage induction motor can perform the operation desired. One condition most frequently met is the matter of rapid starting and stopping or even rapid reversing. For a long time it was assumed that it was necessary to allow the squirrel cage induction motor to run continuously and make use of mechanical clutches and brakes or hydraulic devices to obtain this feature. Yet today there are many applications, especially on drilling and tapping machines and small tool room and turret lathes, where squirrel cage induction motors are starting and stopping twenty to thirty times a minute and doing the work in a satisfactory manner. It is obvious that this represents a much harder job for the motor and control equipment, but the elimination of clutches and other mechanical devices results in a much simpler mechanical design and the reduction in mechanical maintenance easily offsets the slight increase in electrical maintenance.

Complete Lines Available

Today the electrical industry offers a complete line of multi-speed a-c motors giving 2, 3 or 4 speeds, and having a total speed range of 4 to 1. There are many instances where this motor will eliminate the need of a set of change gears and its use is especially desirable where an automatic cycle is involved, which would mean shifting gears for different parts of the cycle. These motors are quite often used on small turret lathes and the screw machines where in addition to the necessity of frequently changing from one speed to the other, they also have to reverse some times at the rate of twenty times per minute.

While at present there is a tendency to avoid the use of d-c adjustable speed motors on machine tools because many plants do not have a d-c power distribution system these still are very useful, especially on the larger type of machines, such as boring mills, engine lathes and planers. These motors have a 4 to 1 range in speed, or more in some cases, by means of motor field control and the speeds can be accurately adjusted over the entire range by means of a field rheostat located convenient to the operator. These motors are especially suitable on spindle drives because they have a constant hp characteristic which makes it possible to make the heavy cuts at low speed and still have high speeds available when it is desirable to take a light or finishing cut. This d-c motor is also used on the more elaborate adjustable voltage systems where the very wide speed ranges are necessary. It will be discussed in more detail later.

D-C Motors Take Punishment

These d-c motors are used on many severe duty cycle applications such as the reversing planer drive which gives an adjustable low speed in the cutting direction and a high return speed. This type of drive, which was developed many years ago, was one of the outstanding early electrical drives and the elimination of the belt shifting mechanism and the screeching of belts on each reversal of the planer was a welcome improvement to all planer operators.

Conventional Motor Limited

From the foregoing it is seen that the conventional electric motor is limited to a speed range of approximately 4 to 1. The feed drives on milling machines, boring machines and many types of combination machines require speed ranges of 60 to 1 and in some applications the theoretical speed range required may be 1800 to 1. It is true that the actual number of machines that have this extremely wide speed range requirement is a small percentage of the total built, but so far as dollar value is concerned it is a much larger percentage because these machines are the largest of the machine tools that are built, and as a result many of them are very expensive.

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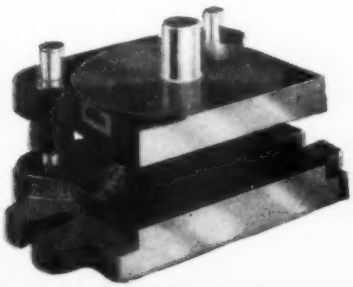

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There is also quite a number of smaller tools that have speed range requirements that are not high, usually 10 to 1, yet these are more than can be obtained with standard electric motors and some electrical solution is desirable.

The drives which have been developed by the electrical industry for this type of application are known as d-c adjustable speed drives and they consist of a d-c motor and an individual source of d-c power supply which is arranged to supply an adjustable voltage to the armature of the motor. By supplying a motor that can have its speed adjusted by field control and also by means of the voltage applied to the armature the motor can be made to operate over a wide speed range. Where the range required is not more than 10 to 20 to 1 the inherent characteristics of the motor and generator is such that a reasonably good speed regulation is obtained without adding any regulating equipment. These drives provide constant hp over the speed range supplied by field control of the motor and a constant torque over the range supplied by armature voltage control.

Separate Power Source Needed

It should be pointed out, however, that this type of electric drive does require a separate power source and, therefore, presents a problem of finding a suitable mounting space. This power supply takes the form of a well known motor generator set or some other form of a rectifier for converting a-c power into d-c power. One of the newest type of rectifiers is the electronic tube rectifier and it has received a great deal of attention during the last few years and promises to become very popular with machine tool builders and users. This unit has the advantage of making it easy to combine the control equipment and the rectifier into a single unit and is usually easier to mount on the machine than a motor generator. Also, since it is a static device it is not a source of vibration which is an undesirable feature on precision machines, such as grinders.

While the mounting of this equipment is a problem, usually the space required is approximately the same as

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for the hydraulic drive since it is necessary to have an a-c motor and a hydraulic pump in the hydraulic system, and is used in exactly the same manner as the motor-generator set or rectifier is used in the electrical system. In making a comparison with mechanical devices, it eliminates the necessity of mounting gears, clutches, etc., between the motor and the driven shaft and this is usually a location where it is very desirable to save space.

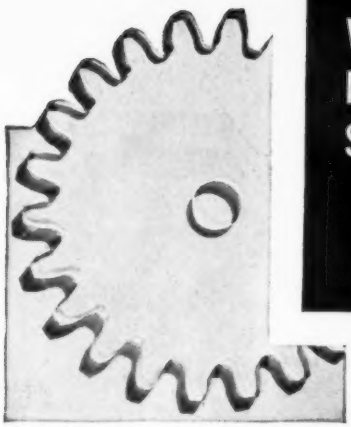
Regulating System Added

For speed ranges in excess of 20 to 1 it is usually necessary to add some form of regulating system to automatically adjust the voltage characteristics of the generator to maintain a preset motor speed independent of load variations and thus obtain good speed regulation from maximum speed to the minimum speed. Drives of this type have been built and have been in successful operation for several years where the total speed range is from 100 to 1 to 120 to 1. These drives are either the electronic type or the MG set type Rototrol rotating regulator added.

Planer Drive

The adjustable voltage planer drive, which was introduced by Westinghouse approximately 10 years ago, and has now been universally accepted, is an outstanding example of the Rototrol type of drive.This drive has a total speed range of 30 to 1 so that if the planer is geared for return speeds as high as 240 feet per minute it still has a minimum cutting speed of 8 feet per minute, and the cutting speed can be adjusted from any speed from 8 feet per minute up.

While this type of drive may, in some cases, increase the cost of the planer as much as 10 per cent, the flexibility of the planer and the speed of reversal and other features makes it possible to increase production 20 to 30 per cent in many cases and easily justifies the increase in cost. It is estimated that today over 90 per cent of the electrical driven planers being purchased are using this type of control. The other 10 per cent consist of various type of plan-



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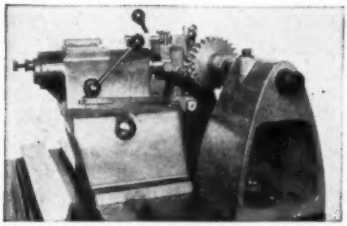

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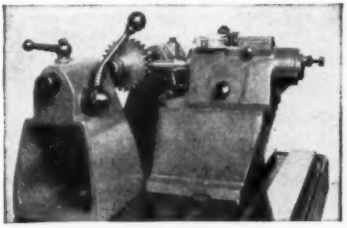

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ers which, for one reason or another, the user does not feel justified in purchasing the more expensive equipment and uses the rheostatic reversing drive which also has been speeded up and improved along with the development of the adjustable voltage planer drive. Even here where the electric drive has been very popular, it still has competition from the hydraulic drive and one prominent planer builder makes this type of equipment exclusively. Usually the hydraulic planers are of the smaller type and are used for short stroke rapid reversing work where, due to the elimination of some of the inertia that is in the electrical drive, a slightly faster cycle of operation can be obtained.

It takes only slight modifications in the circuit of the adjustable voltage planer drive to extend the speed range to 120 to 1 and thereby have a suitable drive for the feed mechanisms on milling machines, boring mills and lathes.

More Electronic Equipment

During the past two years the use of electronic equipment has increased and is now standard on several machine tools. While many advantages can be listed for electronic equipment the major points are as follows:

1—An infinite number of speeds over a wide speed range using a rheostatic source of power.

2—Speeds can be selected easily by a small potentiometer no larger than a standard push button mounted convenient to the operator.

3—Equipment is ideally suited for setting up an automatic sequence of operation.

Special Applications

Perhaps the best way to further demonstrate the versatility of electrical drives for machine tools is to briefly mention a few special applications. One of these which has been described on another occasion is a large ship propeller milling machine with tracer control. With this machine it is possible to take the largest ship propeller yet built and accurately machine the desired contour on both sides of the blade by means of an electrical tracer mechan-

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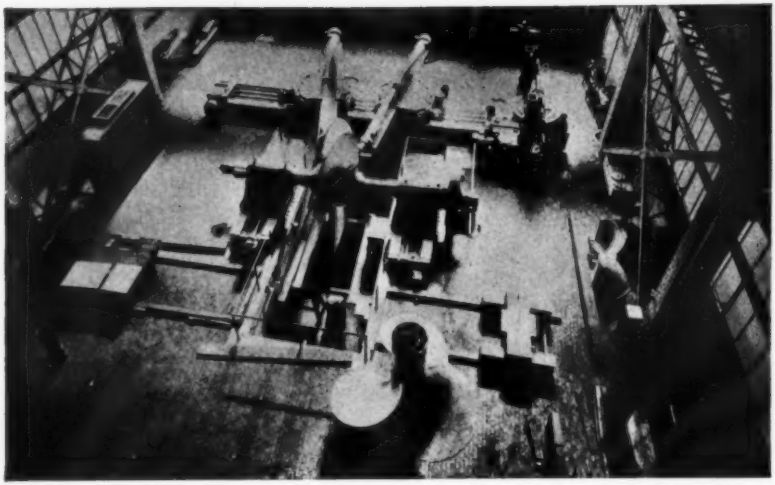

Fig. 1—Propeller being machined from template

ism. Figure 1 gives some idea of the size and complexity of this machine and illustrates how it is controlled from a template that is a small scale model of the propeller being machined. This same tracer mechanism is now being applied to smaller type of machines where it is desired to do contour machining from either full size or scale models.

Another very interesting example of an electronic drive is the fin type milling machine shown in Figure 2 especially designed to machine the fins on airplane engine cylinder heads. This electronic drive is used to rotate the cylinder head and automatically regulate the speed of rotation so that the cutter is removing metal at a constant rate regardless of the depth of cut being taken. By using a simple load control circuit measuring the power input to the a-c motor driving the cutter, the electronic drive automatically regulates the rotation of the cylinder head, either speeding it up or slowing it down to maintain the cutter motor at full load and thus keep the cutter working at

Fig. 2—Especially designed fin-type milling machine.

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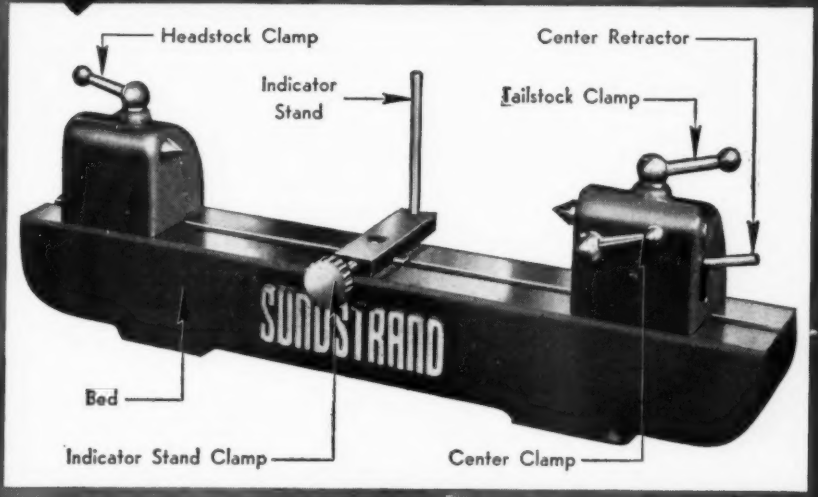

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"One-hand control" over all movable elements leaves the operator's second hand free to control the part being checked. Both headstock and tailstock can be unclamped, positioned and locked in place with a single hand operating the top lever on each.

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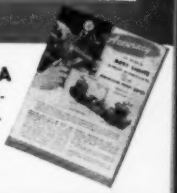

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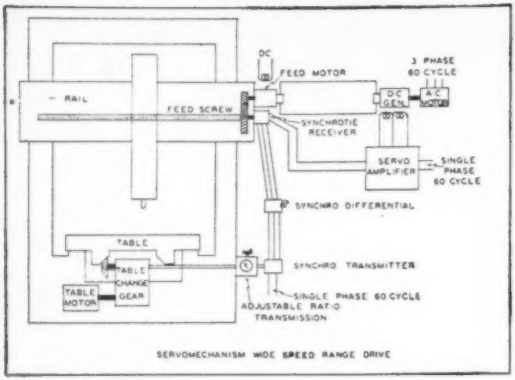

Fig. 3—Showing how servo-mechanism is applied.

maximum efficiency. The addition of this comparatively inexpensive electronic drive increases the output of this machine tool 30 per cent and made it possible for two machines to do the work of three of the machines using the original constant speed feed drive.

Another very interesting drive on which work is being done at the present time is the application of a servo-mechanism to the feed drive of a large boring mill. This is the drive that requires a total range of 1800 to 1 since a boring mill of this type must have its feed drive arranged so that it takes a given feed per table revolution. Large boring mills usually have the feed adjustable from 1/60 of an inch up to one inch per revolution of the table. The table speed is usually adjustable over a range of say 1/5 rpm up to 6 rpm. From Figure 3 it can be seen how this servo-mechanism is applied and that it results in a marked simplification in the mechanical drive, entirely eliminating

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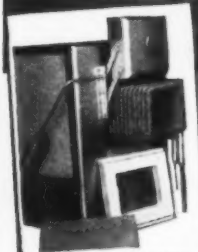
Model OFE . . . for Shop and Laboratory



● Muffle of ceramically bonded aluminum oxide is replaceable complete with nickel-chrome heating element or separate coiled heating element can be furnished for rewinding old muffle core.

SPECIFICATIONS

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Muffle chamber 6" x 5" x 10"
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Continuous 1600° F.
Intermittent 1900° F.
Current consumption
2000 Watts maximum
Shipping weight 170 lbs.
Price—115V. or 230V. $194.00

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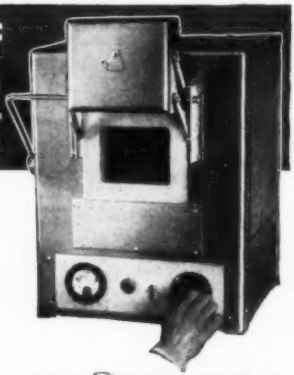

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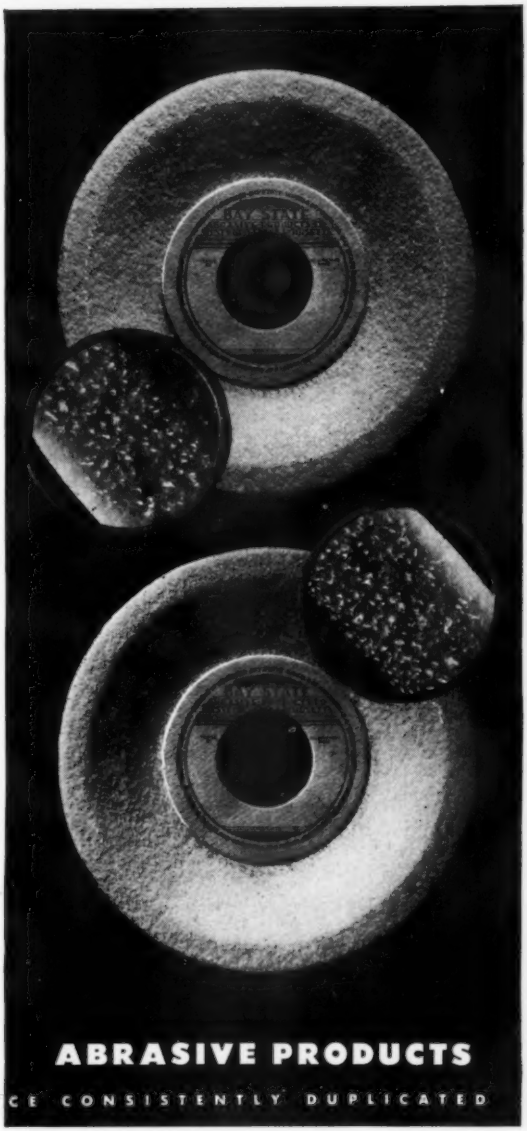

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the mechanical line shaft drive required from the table up to the column and across the rail. It also eliminates the elaborate speed changing gear box and the gear shifting and clutching mechanisms usually employed on a large machine of this type.

No attempt has been made to argue the relative merits of mechanical, hydraulic and electric drives, but rather to point out that in all cases there is an electric drive used for the motive power of the machine and to then show how the electrical equipment can be expanded to perform some of the functions that in the past have been largely done with mechanical or hydraulic devices.

Discussion Summarized

A round table discussion of hydraulic vs. electric drives was held at the Westinghouse Machine Tool Electrification Forum in 1943 in which seven prominent machine tool designers took part. The summary of this discussion which is comprehensive and fair is as follows:

"The Round-Table Group brought out various important points which should be considered in the determination of where a hydraulic or an electric drive should be used.

"One conclusion reached was that both types of drive have their fields of application depending upon the kind of machine tool and the type of motion involved.

"In general, the hydraulic drive is considered better adaptable to reciprocating motions, such as certain planer tables and grinder tables, where short strokes and rapid reversals are encountered. An electric drive is less satisfactory, in such cases, because of its higher inertia and probably greater space requirements for its control.

"On the other hand, electric drives lend themselves better to rotary motions, such as in the case of spindles and feeds, than do hydraulic drives. It was developed that low efficiencies and leaky pipe lines constituted the charge against hydraulics.

"Hydraulic applications are limited by the compressibility of oil. Where the compression of oil in a cylinder or line is apt to give trouble, the advantages

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ROUNDS:	8" Diameter
MOTOR:	½ H. P., A. C. or D. C.
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of the hydraulic drive are apt to be offset by the troubles encountered.

"In the operation of clamps and indexing tables hydraulics has a definite advantage because of the ease of cushioning to a stop, and adjustable force can be brought to bear by merely adjusting a relief valve.

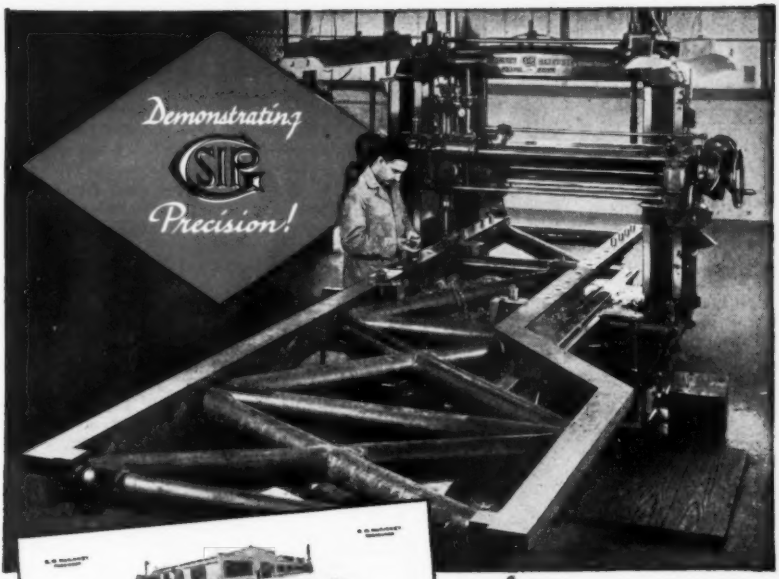
"It was illustrated, however, in the case of a 10-inch plain grinder that the machine is equipped with an electric drive consisting of 7 motors and 2 generators because it is more easily engineered, easily serviced and more versatile than with the hydraulic drive. However, the same company's 6-inch machine uses a hydraulic drive because the market level price of this type of machine prohibits the use of an electric drive which proved to be too expensive.

"The question of comparative space requirements also was debated. It was indicated that a hydraulic motor requires less space than an electric motor of equivalent rating. However, it was argued that while the electric motor of equivalent rating might be larger, one should not overlook the pump and its motor and the associated piping which constitutes a part of the hydraulic system. 'It is easier to pull wires through a machine than it is to pull pipes,' one man stated.

"An investigation of one spindle drive revealed that the low efficiency of a certain type of hydraulic drive dictated the use of a 7½ hp motor, while a 5 hp electric motor was sufficiently large to handle the application.

"In this same connection, it was brought out that to keep space requirements to a minimum with hydraulic drives, high pressures are used in many cases. With high pressures on the hydraulic motor the system is carried to the practical limit and consequently provides less overload rating than the electrical drive, which will carry peak loads safely.

"Where feeds in the order of 0.002" and 0.003" per rpm or ¼" to ½" per minute are involved, it was pointed out that an electric motor with tube control proved very satisfactory and resulted in the elimination of expensive reduction gears. However, it was argued that hydraulics can be used to obtain



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similar results, but care must be exercised in its application to precision tools. This is important because the heat generated in certain types of systems changes the viscosity of the oil and results in variation of the feed rate. However, this has been overcome on some machine tools by the application of refrigeration.

"A discussion from the floor developed the fact that hydraulic drives are designed so that the hp-Torque curves fall within certain set limits, and that if the electrical drives were similarly designed, their efficiencies would also be low.

"It was emphasized that, at present, each type of drive has its field of application, and that both the hydraulic and electrical manufacturers have work to do—the hydraulic people in the field of rotating motions and the electrical manufacturers in the field of reciprocating motions. In many cases, a combination of both drives provides the most satisfactory and most suitable arrangement.

Final Evaluation

"In the determination of the drive to be used on a machine, it would appear that the following chief points should be evaluated.

(1) Engineering.
Which drive lends itself to the design of the machine and fulfills all the requirements?

(2) Sales.
Will the machine with the selected drive sell on the market at a competitive price?

(3) Manufacturer.
Does the selected drive lend itself easily to assembly in the machine with the available production facilities, and can it be produced quickly?

(4) Maintenance and Service.
Is the drive easily maintained and serviced by the user in the field?"

Obviously all the electrical manufacturers are interested in seeing a wider use of electrical equipment on machine tools including these special functions and it has been very gratifying during the past few years to see the rapid development of machine tools using these special electrical devices.

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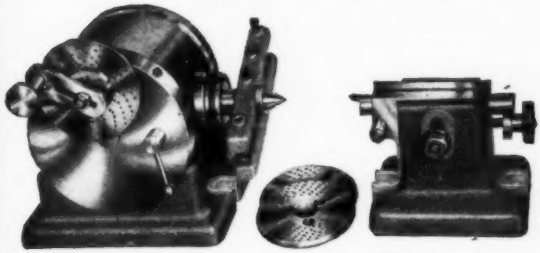

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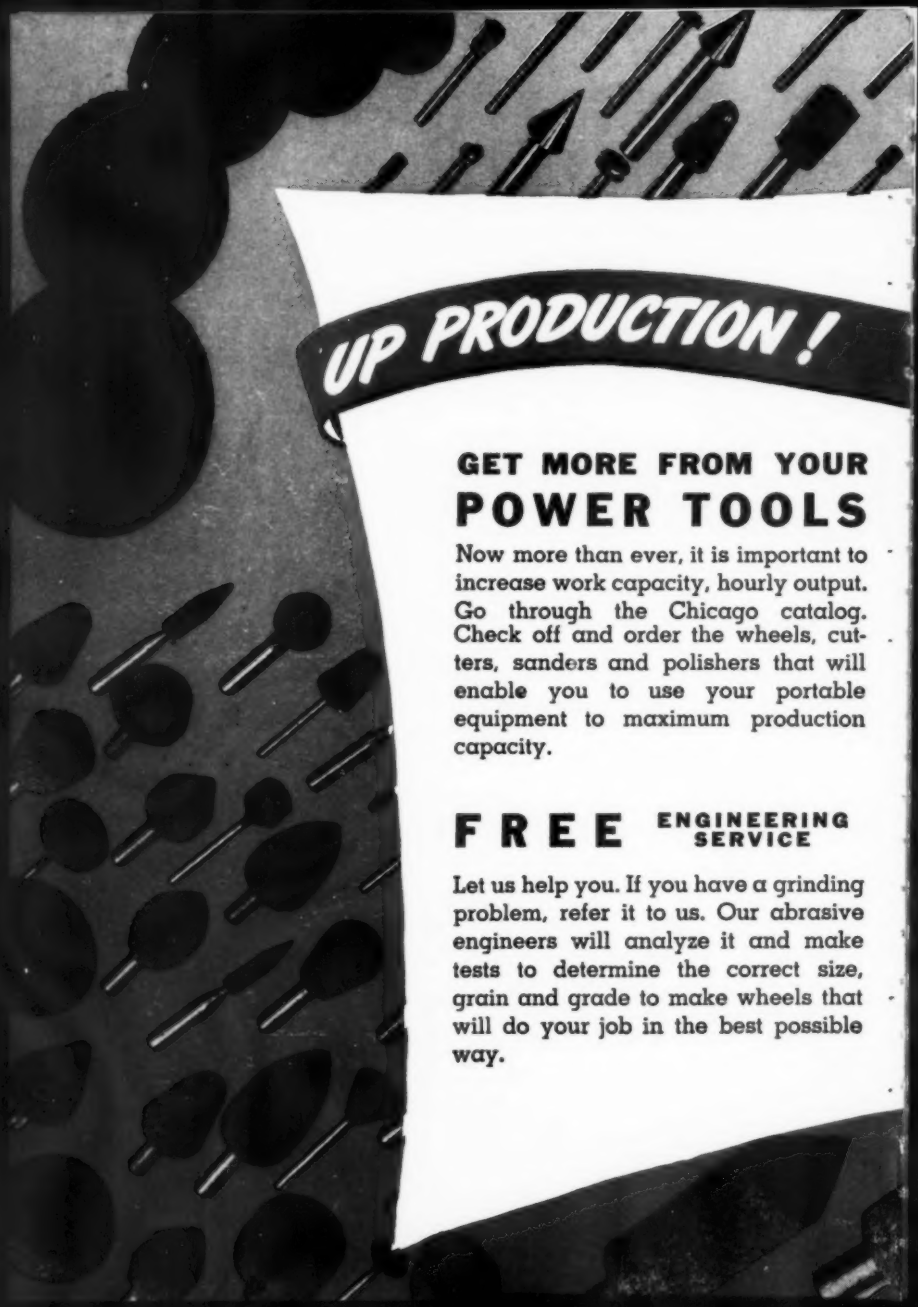
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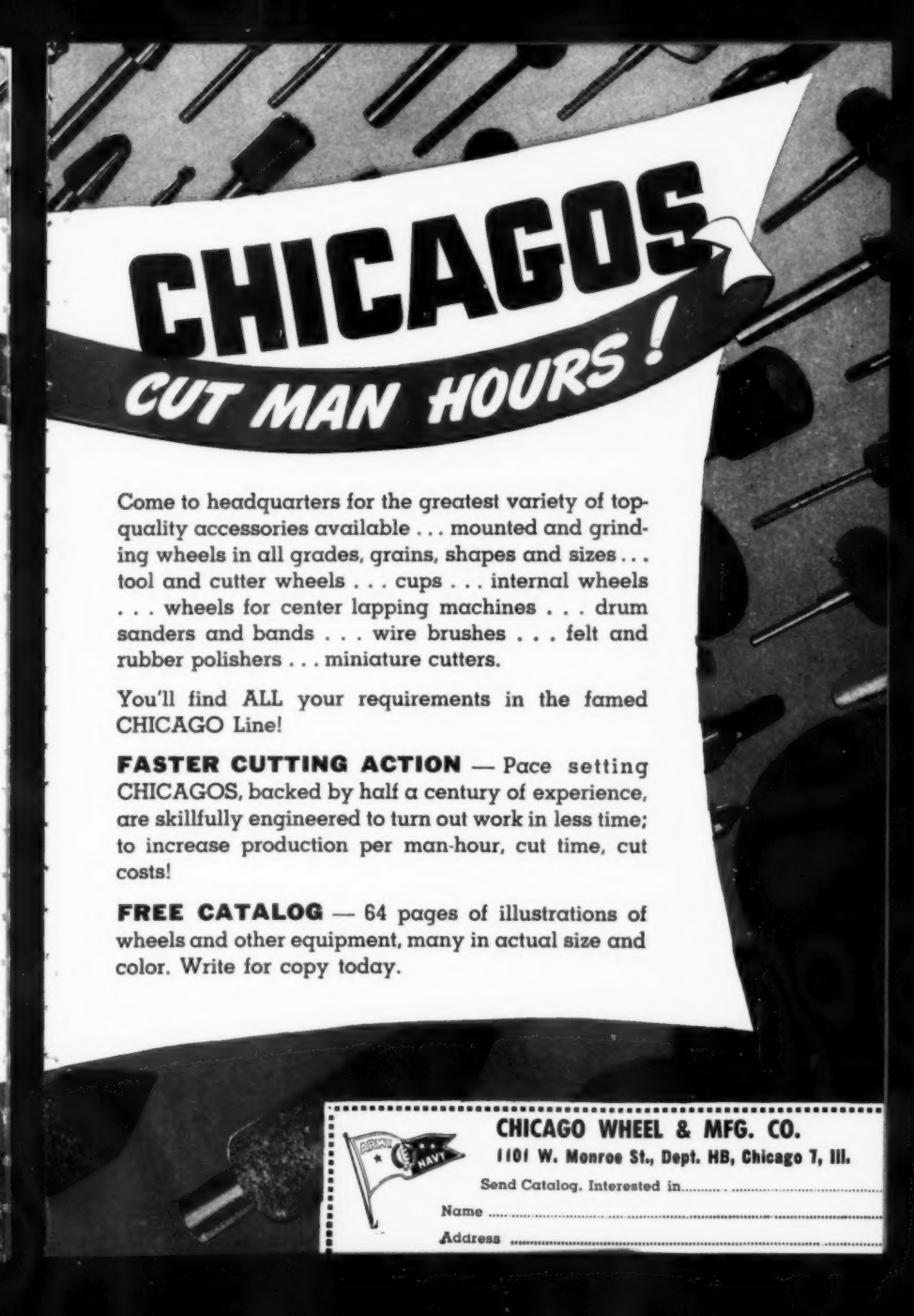
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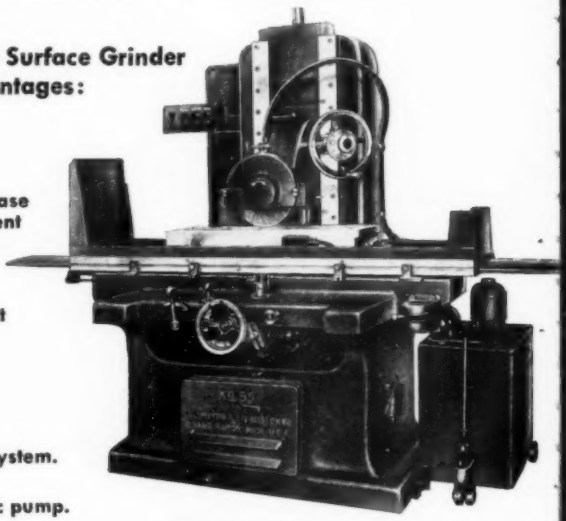

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Automatic Table Travel—longitudinal 38", transverse 13½" • Working surface of table —12" x 36" • Standard wheel size— 12" x 1" x 3" • Vertical movement of wheel head—18" • Spindle speeds—1925 and 2500 RPM. Floor space—150" x 102".

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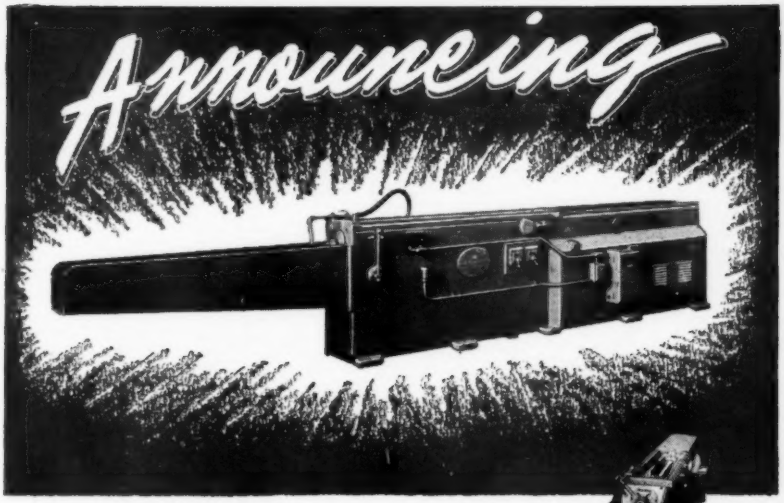

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	MODEL HD-15-66	MODEL HD-20-66
Pull Capacity	15 tons	20 tons
Stroke	66"	66"
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Left: Outer support table provides guide for broach rear pilot and automatic support jack for broach shank. Eliminates manual handling of broaching tool. Ball bearings on slide reduce wear and facilitate movement.

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JESSOP makes three standard analyses of tungsten hot work die steels, from high to low carbon content, as follows: JESSOP 2B (H-C), JESSOP 2B (M-C), and JESSOP 2B (L-C). Choice of one of these three types for hot work applications invariably results in long die life. Recommendations are as follows:

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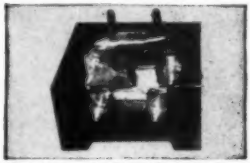
JESSOP 2B (H-C)—Because of its relatively high carbon content this steel attains high resistance to abrasion and pressure.

FOR GENERAL PURPOSE APPLICATIONS

JESSOP 2B (M-C)—Because of its medium carbon content this steel is recommended where both abrasion resistance and shock resistance are important factors.

One section of a hot coining die for automobile spindle, made from JESSOP 2B (L-C).



One section of a hot padding die for large hook, made from JESSOP 2B (M-C).

FOR HIGH SHOCK RESISTANCE

JESSOP 2B (L-C)—Because of its relatively low carbon content this steel is intended for applications where extreme shock and sudden temperature changes prevail.

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Manufacturers of High Grade Specialty Steels

LOOKING AHEAD

By GEORGE S. BENSON*

TODAY'S acute housing shortage was in plain view ten years ago. Experts in the business of building and equipping homes were writing articles and making speeches back in the 1930's forecasting what they called the building boom of the 1940's. They supported their predictions with sound reasoning and leaders in many equipment lines arranged to meet the demand.

A quick look at the census figures, years before Pearl Harbor, would have convinced almost anybody that an unusually big share (say 20 per cent) of the U. S. population would reach an age to be married between 1940 and 1946. Patently this would call for more places to live and, true to form under free enterprise, business men began getting ready quietly to serve this market, but war interfered.

Plans Not Executed

Wars always frustrate plans, and few were revised more in World War II than those of the building trades. Priorities on materials, shortage of labor and the compelling urge for victory changed most things but the predicted need for more housing came right on schedule. It is even bigger than experts estimated ten years ago because war retarded building and accelerated marrying.

Plans made before the war for meeting this expected peak demand are still workable plans. If industry were free today as it was then, people who want homes would be getting them a great deal faster. I believe Hubert U. Nelson of the National Association of Real Estate Boards has proved that Washington bureaucracy is chiefly to blame for today's housing shortage.

Facts to Remember

It's an old story that America has housing a plenty, and it was always true until right lately. France, England and other European countries that have endured regulation of home building since World War I have been short of housing meanwhile. Bureaucracy got a firm grip on American building during World War II and now hates to let-go, shortage or no shortage.

The OPA is the sorest bunion on the toe of our progress. Here is an illustration: Manufacturers of fir doors got caught behind increased manufacturing costs and asked OPA for permission to raise prices 75c per door. It was refused. Result: No doors by mass production. Carpenters can build doors where they hang them, of course, at much loss of time and at several times normal cost.

Industry is Ready

A similar man-made muddle built a bottle-neck in window sash. There's almost no end to the roster of crippling rules in this one industry. Miles Colean, a thoroughly respected Washington economist, says that industries producing building materials are fully reconverted, full capacity restored. Still the most productive nation of history is handcuffed and can't house itself. Why?

A price fixing agency, while proclaiming its loyalty to the people, has refused many small strategic upward revisions, thus halting production. Consumers do without things or pay amazing prices for makeshifts. It savors of the Marie Antoinette school of thought. On being informed that by reason of her extravagance her subjects had no bread, she said "Let them eat cake".

---

*President, Harding College, Searcy, Ark.

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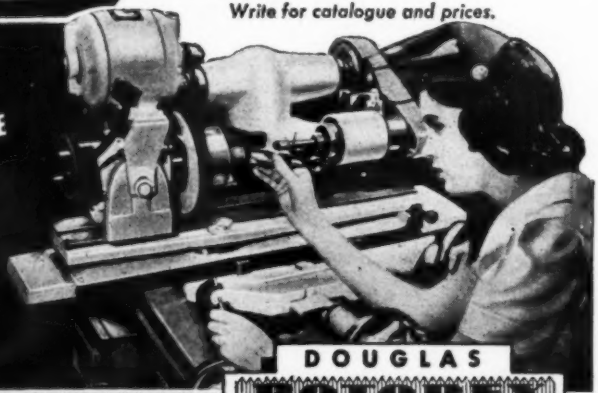

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YOUR TAX PROBLEMS

Interest Rates and Profits

By ARTHUR ROBERTS

INTEREST rates are dropping. Other costs are increasing. How come? The Treasury, in order to keep interest on government bonds at a low point, has forced down interest rates, resulting in artificial control much like OPA on prices, and this is creating a bulge or vacuum in other directions. The same is true of every phase of our economy, which has a gyroscopic ability to right uncontrolled irregularities over a period of time.

Politicians and social betterment workers try to speed up correctives by legislation and controls and are attempting to keep our economic machine running smoothly with no misses or backfires but this prevents the natural adjustments taking place so that sooner or later there are bottle-necks, shortages or surpluses that cry for correction, but nothing can be done about them until an order comes through from Washington. Were such regulations timed to comply with normal economic developments, less harm would result, but only when a condition becomes acute is it recognized.

Under normal economic movement, changes take place gradually, are not perceptible to even the most discerning, like the gradual change in one's physical condition, an evolutionary process impossible to duplicate by an individual just because he has been assigned the task by legislators or born to the purple by votes. A controlled economy is not new. Many nations tried it years ago with dire consequences. The old Roman empire practiced socialistic doctrination when it seemed politically apropos, controlled prices, bank interest, gave relief to the unemployed, broke up big estates, passed them around to the "have-nots" and established extensive public works programs, but slowly the mills of the Gods began to grind and the cycle moved

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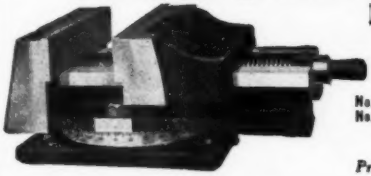

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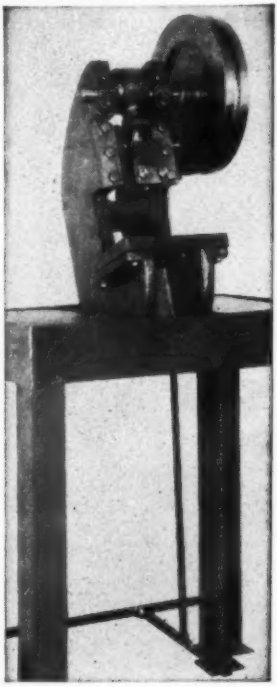

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the other way, the politicians and rich taking over.

The vast accumulation of currency and bank deposits at the disposal of the public is the primary source of low interest rates. As long as the public debt continues to be monetized by loading bonds on the banking system, bonds that are "sold" by a transfer on the bank's books of so much credit to the government's account for the current price of the bonds, the supply of money continues to increase because the government checks out against these credits, pays bills for whatever it owes. In this way, currency out-distances production by far, particularly at a time like this, when shortages and strikes keep output below par.

Many economists state that the wartime government pegged-interest structure has been shattered and the present method of public and private financing has no historical precedent, it lacks a guide, that the situation is confused beyond measure by economic theories. There is much money seeking investment in this country, much of it owned by small investors who depend upon it for income. Low interest rates drive down such income, likewise the tax paid to the Treasury Department. This is another phase of the wheel-within-a-wheel construction characteristic of every free economy. The government saves money on low interest rates in one way, loses it in another. Many companies are refunding their bonds at lower rates, large issues being refunded at 2⅞ per cent.

Our economic system, like all other phases of life, rests upon certain fundamentals, easy enough to understand, once the smoke-screen is removed. Sometimes, through plain ignorance, more often through design, those who stand to win, will throw statistics and argument around the country in haphazard fashion and terminology that bewilders the uninitiated. OPA knows the trick. One circular put out by this agency showed a ragged urchin looking wistfully into a window with one loaf of bread in it marked "$1,000". The writing on the leaflet proclaimed that ceilings would prevent such inflation. Women fall hard for this "scare copy"

and the leaders of women's clubs are not overlooked on circulation.

Ceilings will not prevent inflation. Ample funds in the consumer's pocket will not bring inflation. The government wants to "ceiling" old houses on the assumption that this will help to keep down inflation. If one man owns a house worth in prewar times $5,000, sells it for $10,000 today, that sale does not inflate anything. The seller now has $10,000 more, the buyer $10,000 less. One's income is deflated, the other inflated. Not one cent was added to the money supply by that purchase. The real cause of inflation is the government practice of pumping more and more credit into our banking structure. Until the government begins to reverse the process in actual practice, not on paper, inflation will be an increasing threat but we can minimize the danger by maintaining top production and that is what ceilings thwart.

The bureaucrats and certain radio commentators who earned their spurs writing Broadway gossip columns or newspaper columnists who do know more about the figures shaping striptease artists than the figures on a profit and loss statement, can stir up inflationary fears among the rank and file very easily. Every journalist knows the trick. Put up a straw man and knock him down or tell only half the story. Ninety per cent of Americans know nothing about economics or business costs and are easy prey for sophists. If offered statistics or sound economic doctrine to refute the prattle of theorists, Joe Doakes will spurn the genuine for a book of comics or a movie showing Betty Grable's legs. Yet, the Joe Doakes are many in numbers, their votes run high and this explains partly why a country can follow an unsound economic policy despite the fact that there are sound thinkers in it.

One vicious evil resulting from government controlled interest rates is the indifference of people to save money when returns are unattractive. This fires spending and inflation. Were the interest rates increased, more people and non-bank investors would save or invest, the banks could unload some of their "governments" on the public, the

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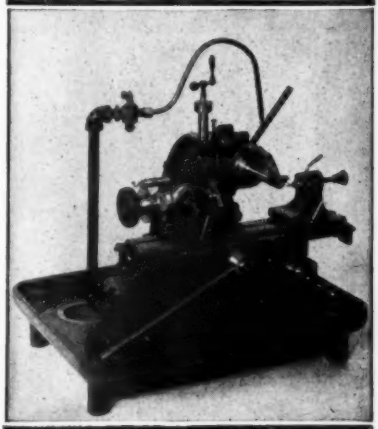

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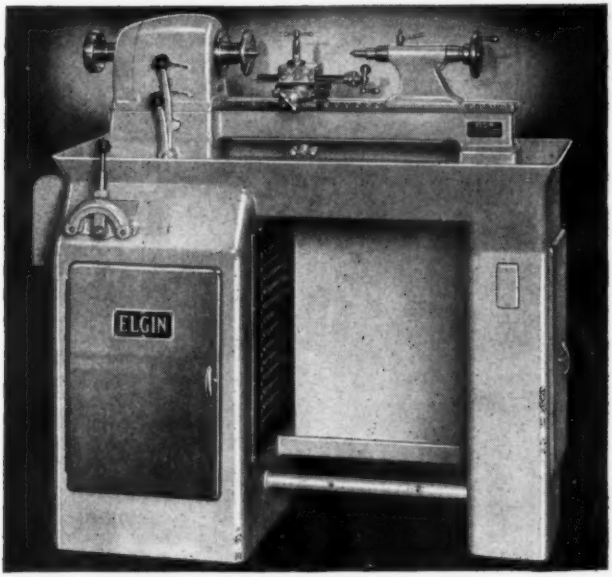
government would get back some of these increased earnings in tax revenue and prices would drop. Individuals and institutional long-term investors used to be the major outlets for securities, today the commercial banking system is replacing them because of the monetized control fostered by the government.

Competition between banks for borrowers of the funds they have available is cutting down interest rates on commercial loans. Big companies are borrowing at 3 per cent or less. Small businessmen must pay more. Mortgage interest is decreasing, some banks offering mortgage money below 4 per cent, others pay 4 per cent and all expenses attendant to the transaction, a radical departure from prewar times when a search could cost $300 on a small piece of property. Long-term loans are now available to small business men who can qualify. Until recently only big business concerns could get term loans. The return on government bonds is not enough to satisfy bankers, big business loans are going at very low rates, so what available funds they have are being earmarked for small business if it qualifies and requirements now are such that many businessmen who would have been turned down in prewar years will now get consideration.

More production and relatively high taxes are the only practical ways to reduce the deficit, now $275 billions The interest rate will mean little to the government under such circumstance but as long as the Treasury Department continues to enlarge the money supply through banking operations, this is not likely to happen. It is believed that if the national budget can be balanced and kept in balance, the excuse for a manipulated interest rate will largely disappear. But the question presenting itself in the interim is whether a balanced budget can be attained in face of a low-interest rate.

There are straws to the wind that a ceiling will be placed on the deficit at $275 billions, the approximate figure today, that the government expense will be trimmed to revenue but this is not enough. The deficit must be reduced. Bonds must be paid off and in-



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terest rates must be brought back to a figure that will enable the financial sector to function satisfactorily. Much hue and cry is raised against Wall Street and high finance, nevertheless, it is an essential part of our economy and when restricted by unsound legislation, the effects are just as disastrous as when the pendulum swings the other way and financial manipulation exacts usurious returns on investments.

It is with heartfelt sorrow that we note the death of Mr. John J. O'Brien, Founder and Chairman of the Board, Retired, of the South Bend Lathe Works, South Bend, Indiana, on April 24th. We know the industry joins us in our feeling of sincerest grief in the loss of Mr. O'Brien.

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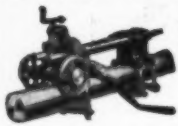

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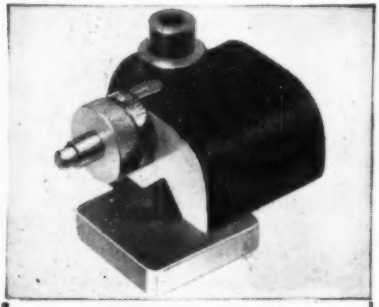

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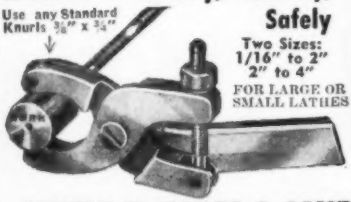

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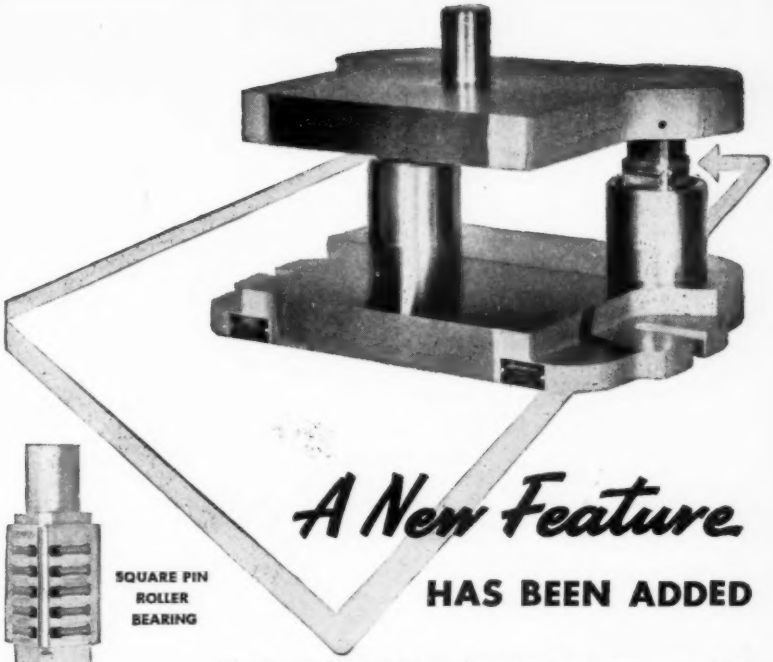

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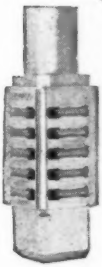

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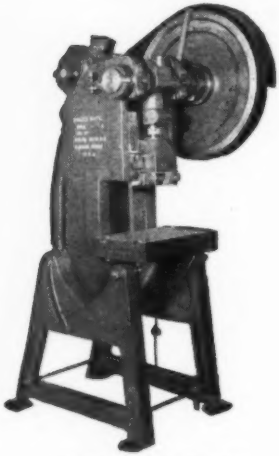

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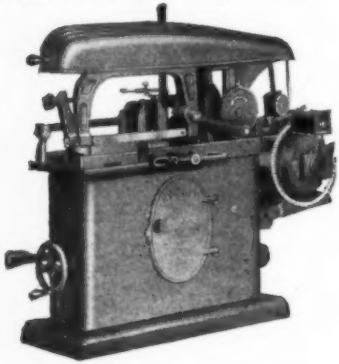

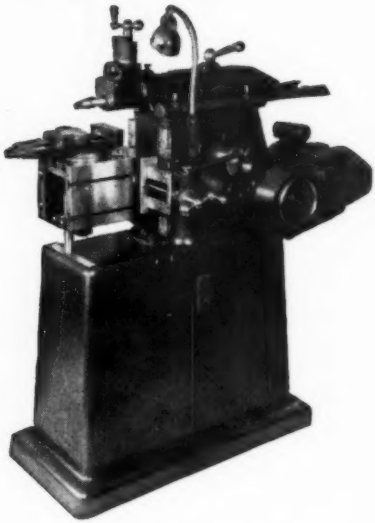

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THE FOREMANSHIP FORUM

By Edmund Mottershead

THE DYNAMIC SIDE OF FOREMANSHIP

THE dynamic phase of the foreman's job is the ever-present problem of dealing with people. Far too many foremen have high technical and executive ability and relegate the problems of human relationships to the backs of their minds, or worse, shove it off onto the shoulders of the personnel or industrial relations departments. The foreman must strive to develop and maintain morale and discipline in his department; must obtain cooperation, not only from his workers but from other foremen and from his superiors as well. Friendliness, loyalty, fairness, appreciation of others, control of his own temper, openmindedness, and many other qualities of leadership are prime requisites of his successful handling of the job.

The dynamic side of his work has three main elements. First he should have a thoro knowledge of people and their motivations. Second, he should understand the use of definite strategies of human relations. Third is the long pull supervision which in terms of human relations means leadership. But before examining these three elements in detail, let's consider just a few of the many reasons why some foremen fail to appreciate the human values in connection with their jobs. Let's consider some types:

Conceit—Often you'll encounter a foreman who has not just a good opinion of himself, but the plain garden variety of big-head. Some men just cannot stand prosperity. Possibly few men could boss others around the way he could. He was the BOSS and no mistake. (He didn't get along very well!)

Outside interests—He was a good fellow . . . . very definitely hail and well met. Everybody liked him. Even his wife. (And three or four other fellows' wives). And all the barkeeps in town. He was a good bowler and the plant ball team is going to miss him at third base. Being precinct committeeman, he made a natural block captain for the OCD, when they could

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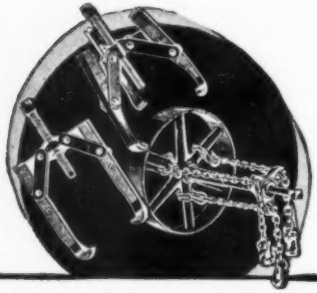

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find him. So he was retired to take care of his outside interests. The company executives decided they wanted to use the telephone even during his working hours.

Excitability—Not that he hated anybody in particular, but when something went wrong, you could hear him a block the other side of the railroad tracks. He ran around with a pocket full of scraps of paper he used to make notes so he wouldn't forget things and then couldn't find the papers until his wife cleaned out his pockets at the end of the week. The army turned him down for emotional instability.

Irresponsibility—He wasn't exactly a buck passer, but it was always someone else's fault when things went wrong. After all the men in his own department had taken the blame for everything, he went to work on the other foremen. They couldn't all be responsible for his department; so the company got a man who would take the responsibility and give everybody a rest. The irresponsible one obtained a position in another firm . . . where he's still trying to pin the blame on others.

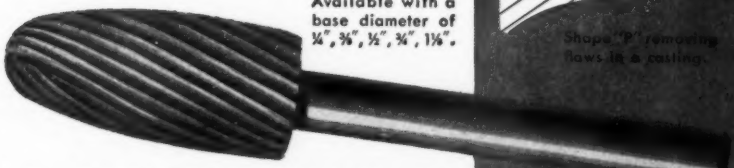
Ambitions . . . for himself only—And outspoken about it. If this fellow didn't blow his own horn, nobody else would. A fellow had to look out for "number one" because nobody else would. He apparently couldn't, and after he had said so, so many times, they didn't. Departmental politics turned out to be bad business when Army Ordnance wanted results instead of excuses. He's still working for himself, only he's his own boss now.

Lack of tact in the front office—The "super" (who by the way had graduated from the same department) didn't know anything about anything any more. Times had changed. When he had a beef, he went right to the top; that was the only way to get results. If the personnel department couldn't pick men for him any better, he's going out and get them himself. Those guys up front don't do anything all day long but warm the chairs anyway; so they ought to have plenty

The Right BUR for the Job

FOR FREE ACTION IN BLENDING AND FINISHING USE

Shape "P" Tree



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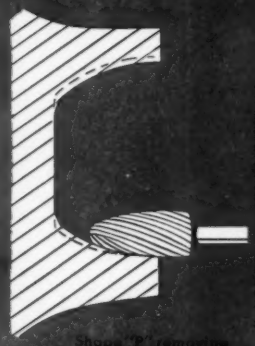
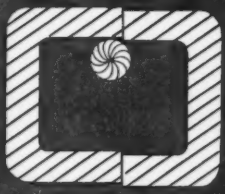


Shape "P" removing flaws in a casting.

Shape "P" KELLER Bur is designed with a small radius at the nose to allow free action of the cutting edge in "hard to get into" places. Like other Pratt & Whitney Burs, it has proved its efficiency at blending and finishing, and is recommended for use in foundries and metal shops. Shape "P" is used to remove flaws and imperfections in castings caused by a slipping core . . . and for removing surplus material. It is useful for blending sections and contour areas. Its smoother operation, longer life, is the direct result of P&W's method of grinding burs from the solid, *by machine*. Request further information on the complete line of KELLER Burs.



Head-on view of Shape "P" showing free action of the cutting edge in a corner area.

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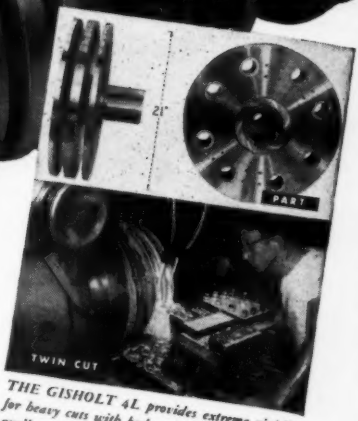
of time to listen to him. Nobody knows who is listening to him now; maybe his wife.

Lack of self-confidence—He wanted to be friends but didn't quite know how. Some of the tough boys started to ride him, and then the whole gang was doing it. He thought they were all against him and didn't know what to do about it. The "super" was after him because production was down, and he was afraid to open his mouth to anybody to try to speed up things. He wasn't too sure of all the technical details of the work in the department, and was afraid he'd lose face if he admitted as much; so he tried to bluff his way thru it. This only made things worse; so the gang rode him worse than ever. He quit.

Inability to handle men—He had plenty of confidence and knew his stuff all right in every way. So much so that he personally supervised and inspected about everything that happened in the place. Somebody cracked off that he was fussier than an old maid in a kitchen. So they tagged him "Lady". He also had a temper, just to help things along. And was a strong believer in the old motto about doing things yourself if you want them done right. It probably never occurred to him that several of the men under him could perhaps do their jobs if he didn't bother them . . . might even do better with a little praise and trust in their ability. They shifted him over to chief inspector. Now he's happy making things tough for the assembly line.

Most if not all of these mistakes could have been avoided if in the first place the foremen had a little fundamental understanding of people, of their basic desires and motives. Professor Harry Overstreet in his book, "Influencing Human Behavior" says, "Action springs out of what we fundamentally desire . . . . and the best piece of advice which can be given to would-be persuaders, whether in business, in the home . . . in politics or factory . . . is to first arouse in the other person an eager want. He who can do this has the whole world with him. He who cannot, walks a lonely way!"

HOW TO MACHINE DEEP GROOVES on a STANDARD GISHOLT TURRET LATHE

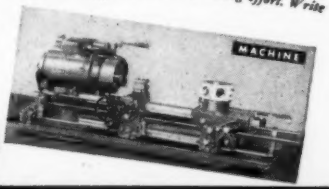


THE GISHOLT 4L provides extreme rigidity for heavy cuts with bed and headstock cast integrally and thick block-type ways of hardened steel which support all bearing surfaces for heavy carriages. This large and powerful machine requires surprisingly light operating effort. Write for literature.

Here's an interesting example of extremely heavy machining done on a standard Gisholt 4L Saddle Type Turret Lathe. It indicates how many a job may be handled with equipment already on the floor and without changes in the base design of the machine.

Heat-treated steel forgings for 21" diameter vibration dampeners for Diesel engines were machined from the solid, with simultaneous cutting of two grooves 7¼" deep by 1-3 16" wide. The only special attachment required on the Gisholt was an auxiliary tool holder and base to hold the long grooving tools. Roughing and finishing cuts were taken, holding to close tolerances for size and squareness, in a total cutting time of one hour and 29 minutes.

For those interested in complete details, some reprints of an article on this unusual job have been made available. Write for your copy.



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Dale Carnegie says—"If you want to gather honey, don't kick over the bee hive. "If you want to stir up resentment today that will kick back at you a month or six months from now, allow yourself to make unjust or stinging criticisms, be sarcastic, dogmatic, "bossy". What people want is a reasonable, sympathetic, understanding approach. Emerson said—"Every man I meet is my superior in some way. In that, I learn from him." If it could be true of Emerson, why doesn't it apply to you and me. Try to figure out the other fellow's good points for a change, and be lavish in your praise . . . not insincere flattery, but simple and sincere appreciation of the other people's good points.

The surest way on earth to influence the other fellow is to talk about what he wants and show him how to get it. That's the big secret. What do people want? Few of us really are satisfied with our lives. All of us have strong cravings for certain satisfactions. These desires are our basic motives. In the language of the psychologist, there are five basic types of motives:— 1—Self preservation; 2—The desire for recognition, or the power complex; 3—Identification; 4—Projection; 5—Rationalization.

1—Self Preservation. This basic motive is expressed in many ways. Surveys have revealed that the primary interest of the average adult is in his or her own health . . . . just let anyone start talking about himself, and that will come out. This motive is also indicated in one's interest in the health and well-being of one's family and friends; in the sex urge, in mating, love of family, etc. It is behind the desire for economic security, and as such is the root of most of our economic striving.

2—Desire for recognition or power. Psychologists tell us that man developed intelligence thru the ages as he developed means of dominating his environment. The first great step was when he learned to use his hands to manipulate things instead of for walking. The next step was his power of speech. Watch children develop, and you will see the process re-

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Quickly interchangeable attachments for Grinding, Sanding, Wire Brushing, Buffing, Polishing and Drilling . . . swiveling pedestal mounting . . . and heavy-duty, 3 H.P. dust and vaporproof motor with geared head . . . make this Mall Flexible Shaft Grinder adaptable to a wide range of metal cleaning and finishing applications.

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IT SAVES TIME**—Constant high wheel speed and ball-bearing mounted spindles assure faster finishing rate. Easy interchangeability of attachments cut "down-time".**

IT SAVES MATERIALS HANDLING**—Caster pedestal base, low caster base or overhead trolley mounting rolls unit right up to work . . . swiveling motor mounting and flexible shaft make power available in any position and at any angle.**

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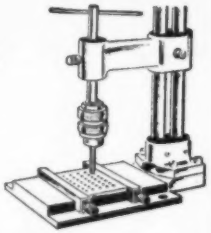

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Precision-built Tapping Fixtures for tool room and limited production work. One tap chuck only takes care of entire tapping or reaming range. Lapped spindle and long guide bushing assures perfect alignment at any tap position, prevents bell-mouthed holes, eliminates tap breakage and guarantees square thread axis and perfect thread fit. ½" Tapper comes with ratchet in head.

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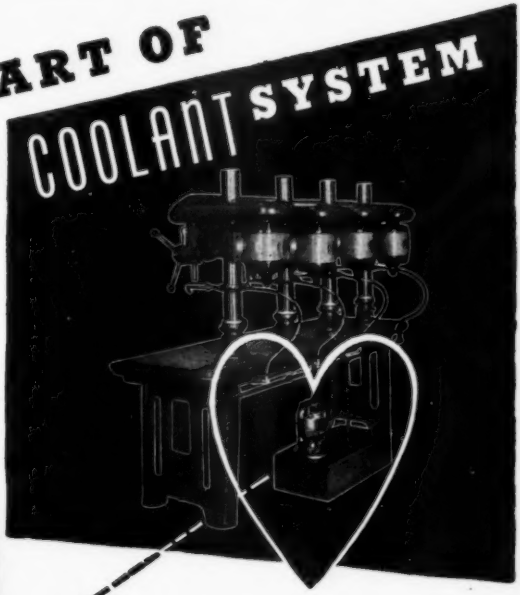
capitulated. They are curious. They want to do things. They demand attention, and howl for it when all else fails. Adults unconsciously are much the same. They want recognition, appreciation, the sense of power and ability, perhaps even more than the sense of security.

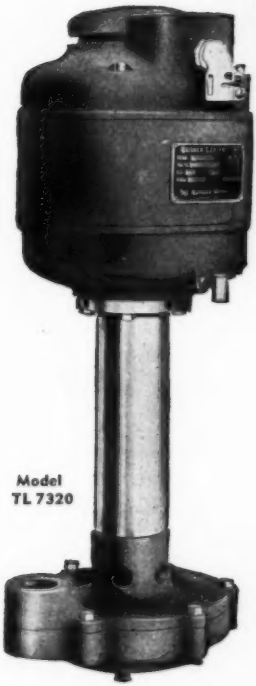
3—Identification. This is the process of bolstering up the ego by vicariously identifying yourself with other people or groups or ideals that you admire. The small boy indulges in hero worship—"I'll get my big brother", etc., the point being that he makes himself feel strong and confident because his brother is larger and stronger and in his mind is identified with himself. "Masons are wonderful people. I am a Mason. ergo:—I am wonderful also." Identification accounts for the group structures of society, for labor and management groups, for trade associations, for such things as tastes in clothes, brand-buying habits, etc. It is the basis of team spirit.

4—Projection. This is in essence the business of bolstering up the ego by pointing out faults in everyone else and thus making yourself feel important. It is inherent in the process of pointing out that President Roosevelt's formula for making coffee from old grounds during coffee rationing was something you had been doing for years; hence, he's no smarter than you are; consequently you're a smart fellow too. Projection underlies the interest we take in the scandals in the tabloid sheets, trying to tear down the reputations of noted people to make ourselves feel virtuous and important.

5—Rationalization. This is the process of making life around us reasonable to ourselves. It is a process which goes on continually, whether logically accurate or not. It includes at one extreme the fellow who "rationalizes" his drunkenness by saying he had to do it with the boys to be one of them, and at the other extreme, the most careful scientific hypotheses trying to explain some physical or chemical phenomenon. Because of this motive in all people, we must make our requests and our actions seem reasonable and sensible to them in the proper light; for otherwise they will find their own reasons to explain your actions.

THE HEART OF YOUR COOLANT SYSTEM





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In dealing with people, it is your first task to determine your own motives and objectives. It is your next task to determine THEIR objectives and motives and desires, so that you may understand them and talk to them from their points of view. In any specific instance of human contact, you should determine not only what motives in general exist in the people with whom you are dealing, and what specific motives you should appeal to at the moment. Remember, that to be a leader and get action from people, you have to make them **want to do it for you.**

The second element in the dynamic phase of the foreman's job is the use of definite techniques or strategies in dealing with people. Most of these techniques spring directly from an understanding of the basic motives of people, and from specific appeals to these motives, but there are a few special techniques worth mentioning briefly:

The assumptive technique—The foreman who simply assumes he is boss without making any particular effort to demonstrate his authority, will get more real impression of that authority across to the workers.

The hurrah technique—This is essentially in the nature of making a challenge to the other fellows. Not so much, "I dare you to do it," as "Let's see if you can do it." Sometimes this can be employed in stirring up a little competition among the workers or between shifts or departments to improve results.

Physical action—Somehow, the basic position and action and attitude of your body and face determine to a large extent your own mental and emotional attitudes, and thus to a very large extent convey to your listeners your real attitudes regardless of what you might be saying in words.

The secondary question—Elmer Wheeler says—"Don't ask IF, ask WHICH." Don't ask a worker if he wants to do it; don't just **command** him to do it; but ask him HOW SOON he can get it done, HOW MANY he can turn out in a given time, WHICH MATERIAL will give the best results, etc.

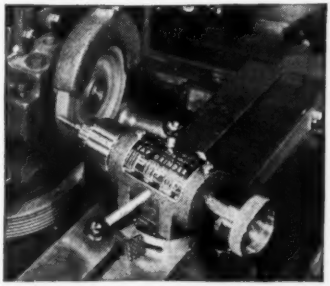
And above all, never forget to ask the worker to do it. Be specific. Give him something definite to do to comply with your request. Don't ask for more production or better quality in a vague, indefinite way. Ask him to use his gages or "mikes" more frequently; wear goggles when grinding; use both hands, etc. Most people like to do favors. It increases their sense of self importance. Let them feel that they are helping and doing you a favor.

These and many other techniques will help to get results from the people you have to live and work with. But there is more to the dynamic side of the job than just understanding people or knowing the techniques of dealing with them. There is the long pull of supervision, the daily contacts with people wherein every detail of the operations of the department may come up sooner or later. And it is in this long pull of daily supervision where real leadership must play its part.

If you were to ask the chief executive of almost any large concern what single quality he felt was most essential to a foreman or supervisor, he would almost inevitably reply: — "Leadership". And leadership is the complete, rounded-out requirement of the man who is to be the "non-com" in industry. The technical phase of his work, including his knowledge and experience and ability to teach; the executive phase of the work including his ability to plan, to manage and administer, and the dynamic phase of the work including his knowledge of people and strategies of human relations all combine and enter into this one quality.

Perhaps you are one of the men who have most of the necessary qualifications for the job. I hope so. Perhaps you lack some of the essential qualifications. In either case, you have the job to do. It may be that your organization is expanding and looking for additional men for supervisory work. If so, you have a problem of finding and choosing the right men. For these reasons, another article in this series on the foreman's job discusses ways and means of selecting and training foremen and supervisors.

DON'T DISCARD DULL TAPS



Can be used on almost any type of tool and cutter grinder, surface grinder — even bench lathes. Tap is held in chuck — may be sharpened after center is destroyed. **No collets.** Complete. No extras. Write!

- Built-in chamfer protractor.
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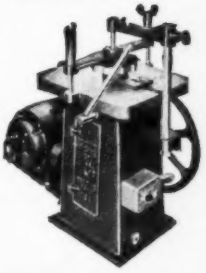

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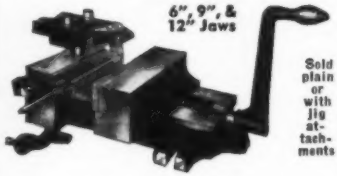
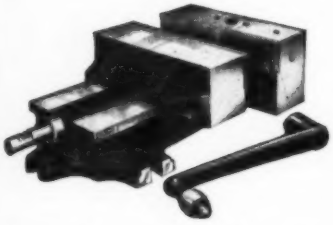
GRAHAM MULTI-PURPOSE VISE





"Vise of a thousand uses" as jig or fixture on many types of machines. Sizes up to 124 lbs. Flush, parallel, square design, plus various Attachments, shell and V-jaws, etc., permits accurate positioning of regular and odd shapes for repeat-operation production work.

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AXIAL RELIEF GRINDING FIXTURE

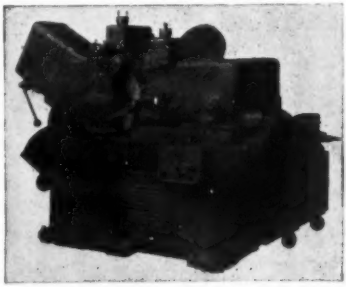
A new axial relief grinding fixture that covers an exceptionally wide range of operations, has recently been placed on the market by the Govro-Nelson Co., 1931 Antoinette, Detroit 8, Mich.

Especially adapted to grinding cutting edges, steps, flutes and chip relief on milling cutters, burring tools, counterbores, countersinks, end mills, reamers, drills and taps, it performs operations which formerly required a variety of different grinding fixtures.

All adjustments are simple, visual and external, the fixture being instantly convertible from right to left hand, and vice versa.

CENTERLESS THREAD GRINDER

Announced by The Landis Machine Company, Waynesboro, Pa., in January 1944 as a post-war product, the new Universal Centerless Thread Grinder is



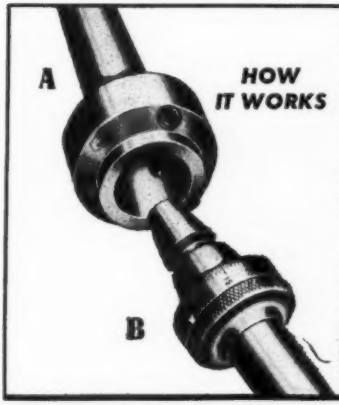
now available for grinding screw threads on straight cylindrical work pieces as well as on headed or multiple diameter parts.

Big Saving in Set-Up Time with—

DIALSET

micrometric adjustment

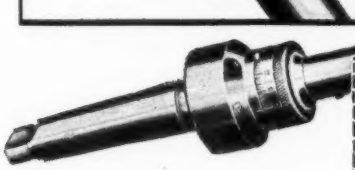
● It's easy to adjust the DIALSET Boring Tool *on the job* to a half-thousandth after one trial cut. In fact, you can adjust to even closer tolerances by reading between the lines on the scale. That saves precision boring set-up time.



HOW IT WORKS

The socket in the adapter (A) accommodates the cone on the insert (B). Both socket and cone are eccentric. When the three setscrews are loosened, the insert can be turned to any reading desired on the dial. Each graduation indicates a change of .0005" in the boring diameter. A full adjustment of .025" can be made. Tightening the setscrews holds the insert in the adapter so firmly that the DIALSET Tool has the rigidity of a one-piece boring bar.

The DIALSET line comprises three groups of tools. The "A" series consists of an adapter and four inserts with minimum cutting diameters ranging from 3/8" to 1-1/16"; "B" series, an adapter and five inserts, 1½" to 2½"; "C" series, an adapter and three inserts, 3" to 4". Straight and taper shanks are standard. Special DIALSETs are made to order.



Mail the coupon or write for bulletin describing and pricing DIALSET Tools. Literature on STATE Four-Cutter Boring Bars and Velsey Black Granite Surface Plates will also be sent if you so indicate.

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Send complete information on DIALSET Tools; also ☐ Four-Cutter Boring Bars; ☐ Velsey Black Granite Surface Plates

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You now have your choice of three Featherweight Kipp Air Grinders as illustrated above. All three are available for immediate delivery and priced extremely low. Madison-Kipp carries a full line of Kipp grinder wheels and accessories. Order today.

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Single diameter work pieces such as set screws, long rods, and rings are thread ground by passing the work pieces in a continuous flow between the grinding and regulating wheels, the "Thrufeed Method."

Headed or shouldered work pieces such as capscrews, headed adjusting screws, stripper bolts and similar multiple diameter parts are centerless thread ground by the "Infeed Method." This type of operation completes the entire thread in approximately one and one half revolutions of the work piece. The work pieces are placed between the wheels one at a time and are automatically ejected at the completion of thread grinding operation.

The control wheel spindle rotates on precision preloaded ball bearings and is mounted in a swivable housing. An electronically controlled drive provides an infinitely variable working speed range to the control wheel and a preselected fixed speed for dressing the wheel.

A profile diamond type dresser is mounted over the grinding wheel and a similar dresser over the control wheel. Each dresser maybe equipped with a profile cam to form the face of the wheels to any desired contour.

A heavy duty automatic crush dresser is attached directly to the bed of the machine for forming the thread forms on the grinding wheel. A geared motor is incorporated in the dresser for driving the crusher roll and grinding wheel at a slow speed when dressing.

When equipped with an automatic hopper the machine is fully automatic in operation except for dressing the wheels and making size adjustments.

ELECTRODE HOLDER CATALOG

In the 1946 Twecolog you will find complete information on the new line of "Twecotong" insulated and semi-insulated electrode holders. You can procure a copy of this catalog by writing Tweco Products Co., Wichita 7, Kansas.

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A new catalogue on the JO Line torque wrenches includes specifications of all the tools and illustrations of many production, inspection and servicing operations, in both plastics and metals, and also gives complete tables of suggested torque values for automotive work, general assembly, etc.

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for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

EASY TO OPERATE • ACCURATE • DEPENDABLE
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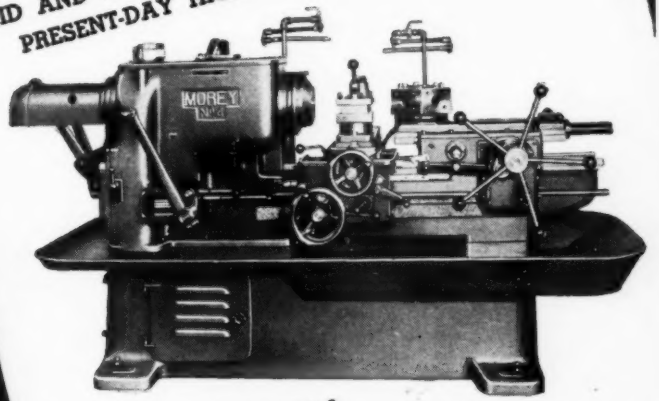
PRESENT-DAY HIGHSPEED CARBIDE TOOLS



#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length, 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE
Also available in No. 3 Universal, 1½" capacity
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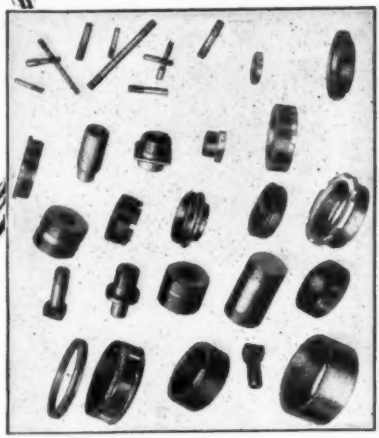
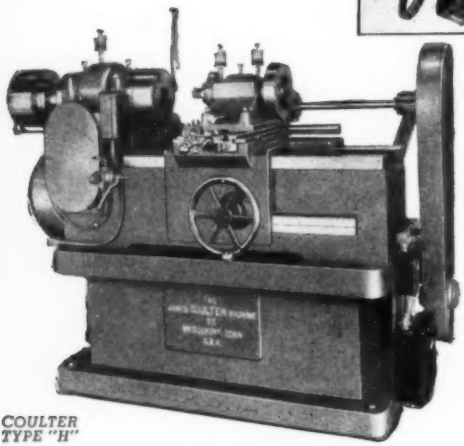
SAVING MINUTES

WHEN MINUTES COUNT

WITH A COULTER HOB THREAD MILLER





COULTER TYPE "H"

ACCURATE HOB THREADING is done with Precision and Speed on this RIGID . . SIMPLE . . . Fully motorized COULTER Machine. Unlimited capabilities for either right or left hand Threads — Internal or External.

All parts held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures can be threaded.

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The James COULTER Machine Co.

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FOLLOW THIS GUIDE TO HACKSAW ECONOMY

The chart at the left gives you the right pitch and, for machine cutting, the right speed for cutting almost any material.

FOR HAND SAWING

Material		Teeth per Inch
Aluminum	Solids	14
Angles	Heavy	18
Angles	Light	24
Babbitt		14
Brass	Solids up to 1"	18
Brass Pipe		24
Brass Tubing		24
Bronze	Solids up to 1"	18
BX Cable	Heavy	24
BX Cable	Light	32
Cast Iron	Up to 1"	18
Channels	Heavy	18
Channels	Light	24
Cable	Heavy	18
Copper	Solids up to 1"	14
Drill Rod	Over ½"	18
Drill Rod	No. 30 to ¼"	24
Drill Rod	No. 30 and smaller	32
General Purpose Cutting		18
Iron Pipe		24
Metal Conduit		24
Sheet Metal	Over 18 gage	24
Sheet Metal	Under 18 gage	32
Steels	½" to 1"	18
Steels	½" and under	24
Tubing	Over 18 gage	24
Tubing	Under 18 gage	32

FOR POWER SAWING

Material to be Cut	Teeth per In.	Strokes per Min.	Weight or Pressure, Lbs.
Aluminum Alloy	4-6	150	60
Aluminum, Pure	4-6	150	60
Brass Castings, Soft	6-10	150	60
Brass Castings, Hard	6-10	135	60
Bronze Castings	6-10	135	125
Cast Iron	6-10	135	125
Copper, Drawn	6-10	135	125
Carbon Tool Steel	6-10	90	125
Cold Rolled Steel	4-6	135	150
Drill Rod	10	90	125
High Speed Steel	6-10	90	125
Machinery Steel	4-6	135	150
Manganese Bronze	6-10	90	60
Malleable Iron	6-10	90	125
Nickel Silver	6-10	60	150
Nickel Steel	6-10	90	150
Pipe, Iron	10-14	135	125
Slate	6-10	90	125
Structural Steel	6-10	135	125
Tubing, Brass	14	135	60
Tubing, Steel	14	135	60

When using "S-M" Molybdenum or High Speed Steel Saws, the same pitch of teeth may be used, but the speed can be increased. Coolant Should Be Used For All Materials Except Cast Iron.

STARRETT HACKSAWS

The list below describes briefly the wide range of Starrett hand and power hacksaws from which you can select the right blade for any job.

FOR HAND SAWING

- *Starrett Standard* Flexible Back, All Hard or "Semi-Flex" blades cover all ordinary service requirements.
- *Starrett "S-M" Molybdenum* blades are specially tempered for fast cutting of hard metals at low cost per cut.
- *Starrett 18-4-1 Tungsten* High Speed Steel blades handle all the hard-to-cut metals.
- *Starrett "Safe-Flex"* high speed steel blades with flexible back and hard edge are virtually unbreakable however tough the job.

FOR POWER SAWING

- *Starrett "S-M" Molybdenum* saws have a remarkable record of production performance at low cost per cut.
- *Starrett High Speed Steel* 18-4-1 Tungsten all hard blades are ideal for light and heavy sawing of high alloy metals, stainless steel, phosphor bronze, tool steels, chrome steel, monel, etc.

Every Starrett Hacksaw is milled, heat treated, tested and inspected to meet Starrett standards of quality and value.

Be sure you use the right Hacksaw for the job. Ask your mill supply distributor for *Starrett* Hacksaws.

THE L. S. STARRETT CO. • ATHOL • MASS. • U. S. A.

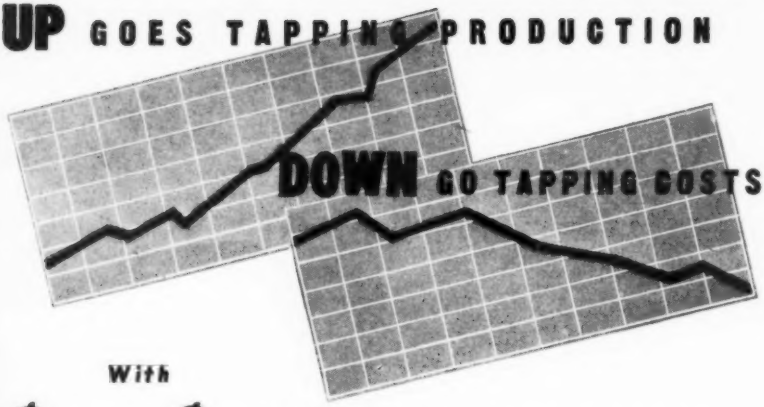
World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK

HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

UP GOES TAPPING PRODUCTION



With

Ettco-Emrick TAPPING ATTACHMENTS

on your drill presses

If you need more tapping production, get the extra capacity from your drill presses. Just clamp high speed, sensitive Ettco-Emrick Tapping Attachments to the spindles, and you're set to do any tapping within the range of No. 0 to 1" taps. No need to worry about high tapping costs either. Exclusive Ettco-Emrick design and construction features not only make tapping easy, even for inexperienced operators, but also give full protection against broken taps and work spoilage.

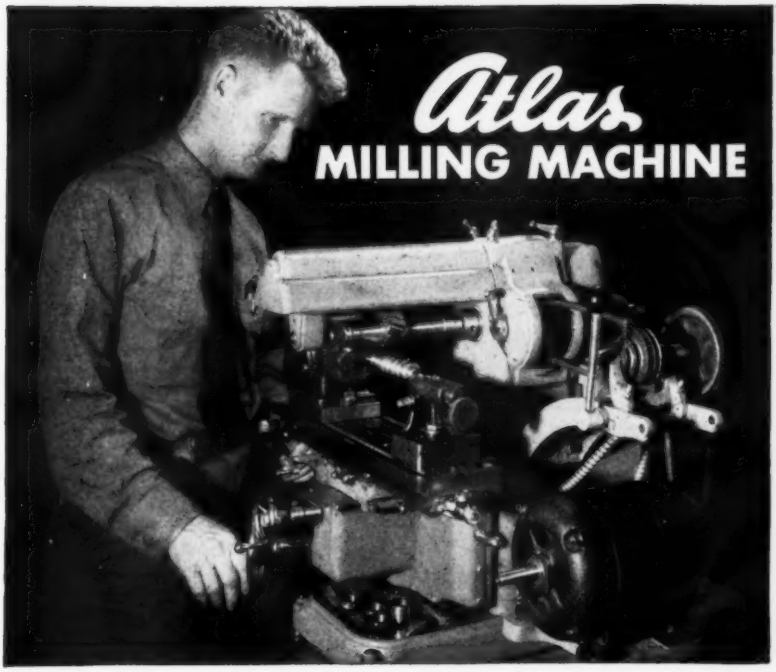
BULLETIN No. 2
gives full details. Write for a copy.

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn 6, N. Y.

Detroit 1 • **Chicago 6**

Over 25 years specialization in solving industrial drilling and tapping problems



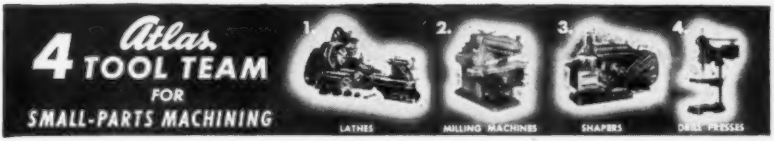
Cuts Machine Hour Costs on Small Parts Milling

The Atlas milling machine is one sure way to meet the production-cost challenge of rising labor rates. Its original cost is low. It requires but a 1/3 HP motor. It handles the full range of small parts milling with the precision and dependability of larger machines.

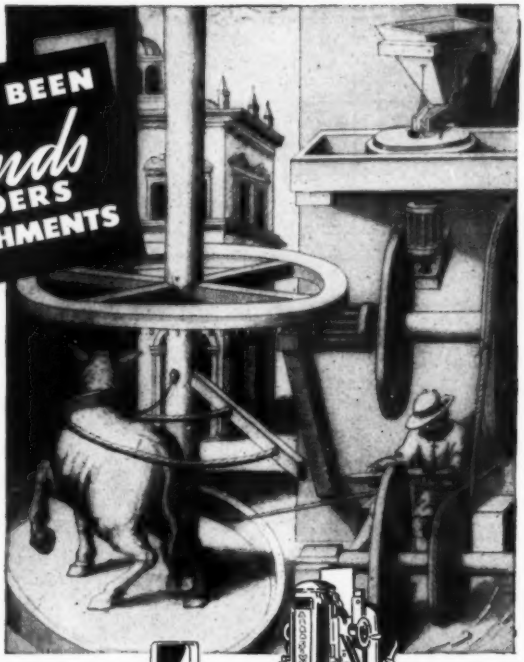
The table is 4½" x 18" and travels 10" longitudinally and 3½" cross-table. Eight spindle speeds from 62 to 2870 RPM provide correct surface speeds for all types of work and cutters. Choice of manual, lever, or Change-O-Matic table controls. When you add air chuck and control devices it becomes a semi-automatic machine, capable of surprising production records.

The Atlas milling machine is part of the Atlas 4 Tool Team designed to "match the machine to the job" for greater speed and efficiency on small parts operation. Send for latest catalog with complete specifications and operating views.

ATLAS PRESS COMPANY
650 N. Pitcher St.
KALAMAZOO 13D • MICHIGAN



THERE HAVE BEEN *All Kinds* OF GRINDERS AND ATTACHMENTS



American ingenuity has brought modern grinders a long way from this ancient one horsepower grinding machine with its cumbersome gearing, rope belting and strange attachments. The bearded operator, without leaving his work, increased the r.p.m. of the grinding wheel by a sharp prod on the unlucky horse.

Illustration from Bettmann Archive

ABRASIVE M-34

VERTICAL SPINDLE SURFACE GRINDER WITH WET GRINDING ATTACHMENT

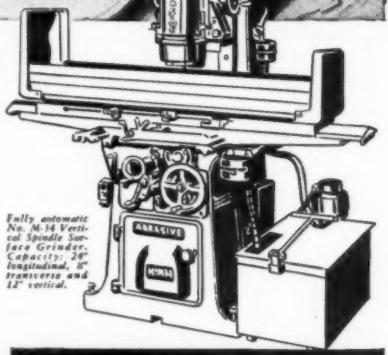
Compact, powerful and accurate, the Abrasive M-34 fully meets today's requirements for a precise production grinder. The motorized spindle eliminates belt drive and delivers maximum power at the cutting point . . . takes heavy cuts with excellent finish. Massive one-piece bed casting minimizes vibration. Table feeds are automatic, with hydraulic shock absorber to cushion table reversal.

Ask for descriptive bulletin.

ABRASIVE MACHINE TOOL CO.

East Providence 14, Rhode Island • Dealers in Principal Cities

Write us for information on ABRASIVE Machines on the Government Machine Tool Surplus List . . . just send the machine serial number. Attachments, accessories and repair parts are also available.



Fully automatic No. M-34 Vertical Spindle Surface Grinder. Capacity: 24" longitudinal, 8" transverse and 12" vertical.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

Problems In Applying Rapid Reversing Drives

By R. H. CLARK*

THE use of rapid reversing type motors on machines can be justified by the need for one or more of the following inherent features of this type of motor:

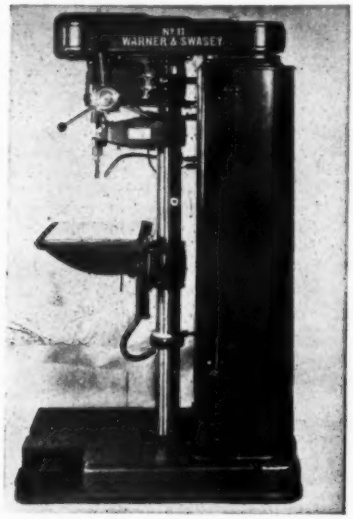


Fig. 1. Two-speed motor on this machine.

1. High starting torque for fast acceleration.

2. High reversing torque for fast and accurate plug stops and reversals.

3. Ability to operate under severe duty cycles without overheating and with a small amount of maintenance.

There are, however, several reasons why this type of motor is not more widely used:

1. Motors are special and expensive.

2. In many cases, machine production is limited by reversal capacity of motor. The more automatic the machine, the more this is true.

3. Difficulty in getting motor application data from electrical manufacturers.

4. The great amount of development work required of the machine builder, as well as the electrical manufacturer, before a successful machine is produced.

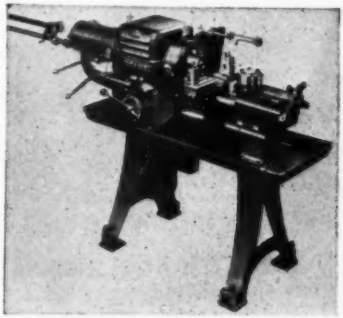


Fig. 2. Four-speed built-on-spindle motor used.

This type of motor is used on three types of machines at Warner & Swasey, as follows:

PRECISION TAPPING AND THREADING MACHINES

The spindle drive motor of the larger machines is a two-speed, rapid reversing, gear head motor (Figure 1). Because of the gear reduction in the motor itself, the WR^2 external to the motor is relatively unimportant, and, therefore, the motor WR^2 is kept as small as possible to obtain as much reversing capacity as possible.

• • •

*From a paper presented by R. H. Clark, of Warner & Swasey Co., at the Machine Tool Forum held at Westinghouse Electric Corp., Pittsburgh, April 9 and 10, 1946.

The accuracy of repeat of the reversal point for each stroke is used for tap depth control and has been found to be very high.

SMALL HAND TURRET LATHES

Two sizes of small turret lathes use four-speed, built-on-spindle motors of the rapid reversing type (Figure 2). These machines produce a wide variety of small parts requiring frequent starts, reversals, speed changes and plug stops. Since most of the parts are made from bar stock held in collet chucks and the WR^2 external to the motor is small, the motor performance is satisfactory for most jobs. However, for some second-operation and chucking work, motor heating limits production, and special insulation or other means must be used to increase motor reversal capacity.

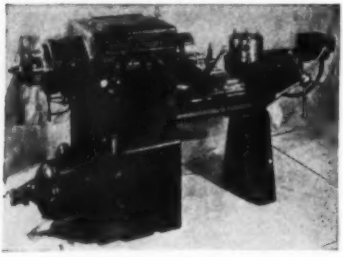


Fig. 3. Two-speed motor used here.

SEMI-AUTOMATIC SPECIAL PURPOSE TURRET LATHES

The 16 inch Electro-Cycle Turret Lathe is the latest design to use rapid reversing motors — and obtaining the two-speed motor with satisfactory reversing capacity was the greatest single problem in the design of the machine (Figure 3). Because most of the brass and other light metal work produced on this machine is held in large chucks and fixtures, the WR^2 external to the motor is large, being as high as 10 times motor WR^2 in some cases. This calls for very special attention to motor ventilation and insulation to obtain satisfactory reversing capacity.

The electrical manufacturers can do much to make the application of such motors easier by clearing away some of the air of mystery which surrounds the engineering theory involved. They should also publish application data consisting of rotor WR^2, reversal capacity, starting currents and torques, plugging currents and torques on motors suitable for reversal or plug stopping service. For multi-speed motors, information is needed on the interrelation (from a motor heating standpoint) between starts, plug stops, speed changes and reversals for the various speeds, in order to properly establish maximum machine performance.

New and better motor designs must also be developed to constantly improve motor performance.

On the other hand, the machine tool builder must furnish to the motor manufacturer accurate data on machine WR^2 duty cycle (or equivalent motor reversal capacity) on which to base the motor design.

We are not satisfied with the job the electrical industry, as a whole is doing on rapid reversing motors. What can you do to provide us with better motors and more information?

A. E. BAAK PROMOTED

Paul Henry Co., 2037 S. La Cienega Boul., Los Angeles 34 Calif., manufacturers of electrical parts and equipment, announce the appointment of Albert E. Baak, as Executive Director of their Controls Division. Mr. Baak has been associated with the Minneapolis-Honeywell Regulator Company for the past twelve years.

BEARING RACE TESTER

Production measurement of waviness on bearing races can now be accomplished by an instrument called the Race Tester, introduced by Physicists Research Co., Dept. 3, Ann Arbor, Mich. This instrument quickly gives the average height of the waviness on ball and roller bearing raceways.

The Race Tester is essentially a production instrument for use in race grinding and finishing departments. Operation consists of slipping the race to be measured on a rotating spindle, holding the converter against the raceway, and noting the meter readings. A speaker and oscilloscope are also provided for further analysis of the surface.

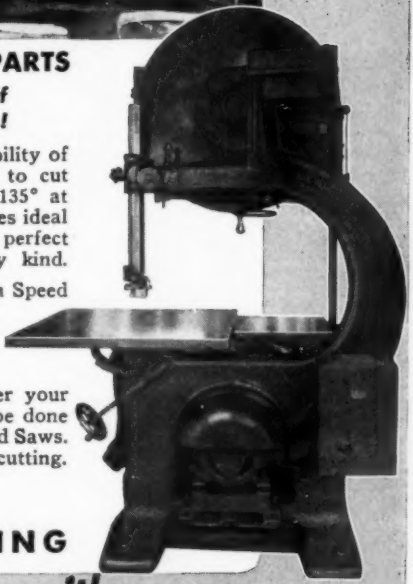
The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.



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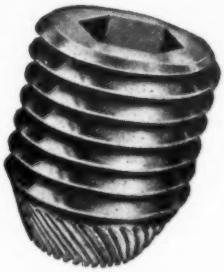
HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

UNBRAKO

Reg. U. S. Pat. Off.



Pat'd. & Pats. Pending

STARS OF THE ASSEMBLY LINE!

Yes, "Unbrako" Socket Screws are the favorites of shop-men everywhere, because they know that the "Unbrako" Screws can be depended upon for great strength, accurate threads . . . and finest service.

The knurled "Unbrako" Socket Head Cap Screw (at left) is a time- and money-saver, because it can be screwed-in faster and farther before using a wrench. How come? — the Knurled Head provides a slip- and fumble-proof grip, even for oily fingers.

The "Unbrako" Socket Set Screw with the Knurled Point (at right) is a Self-Locker, because the knurled point digs-in and holds firm—against even the most stubborn vibration! Yet, this screw can easily be backed-out with a wrench and used again and again.

These screws come in sizes from No. 4 to 1½" in diameter; full range of lengths. Write for the "Unbrako" Catalog, today, for further information. **"Unbrako" and "Hallowell" products are sold entirely through distributors.**

Knurling of Socket Screws originated with "Unbrako" in 1934.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

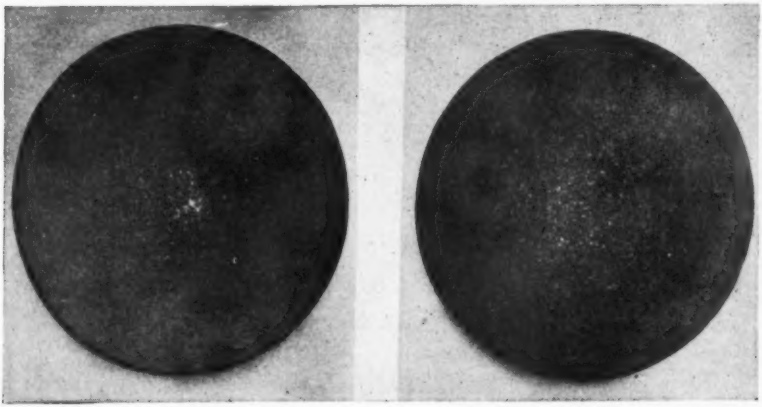
JENKINTOWN, PA., Box 606. Boston, Chicago, Detroit, Indianapolis, St. Louis, San Francisco

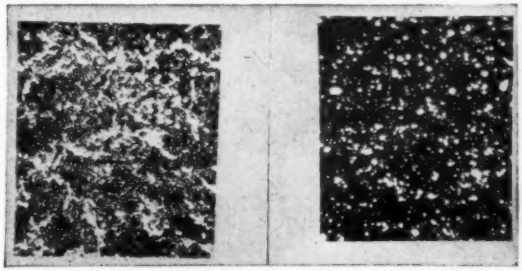
MAJOR IMPROVEMENT IN HIGH SPEED STEELS

AN IMPROVEMENT in the quality of high speed steels, achieved by a more even distribution of free carbides thru-out the steel and elimination of their segregation in the center, is announced by Latrobe Electric Steel Co., Latrobe, Pa.,

The tool steel bars and other shapes produced by this Process—and named Desegatized Steel—are, according to the manufacturer, more uniform than the existing standards of quality in the industry. In shop performance, Desegatized Steel shows uniformly excellent results under heat treatment; longer tool life; longer run between grinds; reduction of warpage and breakage to

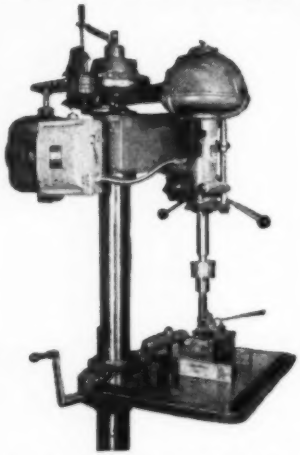
Structure of hardened discs cut from two bars of high speed steel. Left: Standard high speed steel bar 4" round, 18-4-1 type, Latrobe Electrite No. 1, discs hardened, polished and etched. On right: Average bar of Latrobe Electric Steel Co.'s Desegatized high speed steel (4" round, 18-4-1 type, Latrobe Electrite No. 1, discs hardened, polished and etched).





These photomicrographs, magnified five hundred times, show central structure of a standard and of a Desegatized Steel bar. Left: is center of a typical standard high speed steel bar. On right: is center of an average bar of Latrobe Electric Steel Co.'s Desegatized high speed steel. Hardened discs are used, since true segregation is more apparent after hardening than in the annealed condition.

THREAD-ALL Tapper



PRECISION TAPPING !! LICKED !!

By Converting Any Drill Press into a Precision Tapping Machine.

Check these advantages:

Handles small taps without fear of breakage. Takes sizes up to 1½" with ease.

Gives precision tapping without need of lead screws.

Electro-magnetically controlled positive depth setting.

No adjustments required for tap sizes.

Silent forward and automatic high speed reverse action.

Taps right or left hand without adjustment.

Machine may be used for drilling, reaming, counterboring, etc. without adjustment.

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GRUEN GAUGE CO.

10039 Marcus Ave. Detroit, Mich.

a minimum, and all-around more consistent tool performance.

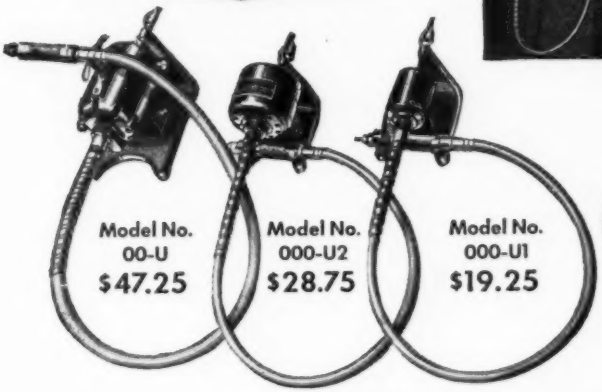
The Desegatizing Process was developed by Latrobe Electric Steel in the course of years of continuous research. Purpose of the undertaking was to overcome the segregation of a certain amount of free carbides in a brittle mass near the center of high speed steel bars and other shapes. This central grouping represented a non-uniformity and hence a source of weakness. Metallurgists had always considered that an even distribution of the carbides, which create cutting and wear-resistant qualities, would produce the ultimate in tool steel quality. Yet the problem remained unsolved; and a certain amount of segregation came to be accepted as unavoidable.

The Desegatizing Process represents a great step toward the ideal of even distribution of the carbides, which it achieves in a practical sense; and opens new prospects for high speed steel quality. The elimination of segregation produces steel bars of remarkable uniformity. From this characteristic stems the exceptional performance of broaches, milling cutters, hobbs and the like, since the strains set up have no main center of non-uniformity or weakness to seek. The uniformity of each tool adds to its sturdiness in shop use, permitting longer runs between grinds, more dependable and longer tool life, and reducing warpage and breakage during use to a heretofore unrealized minimum.

The performance claimed has, according to the Company, been exhaustively verified under the most severe conditions of shop use by a number of Latrobe's customers, and established thoroughly by careful records kept on every tool. Desegatized Steels are now stocked in all the Company's warehouses, and are ready for marketing.

A young couple informed the minister of their church that they wished to be married right after the service on Sunday. So when the service was over, the minister said, "Now will those wishing to be united in matrimony please step forward." Twenty women and one man approached the pulpit.

WYCOFLEX
"Universal"
HIGH SPEED
GRINDER



Completely Mobile

Best for High Speed

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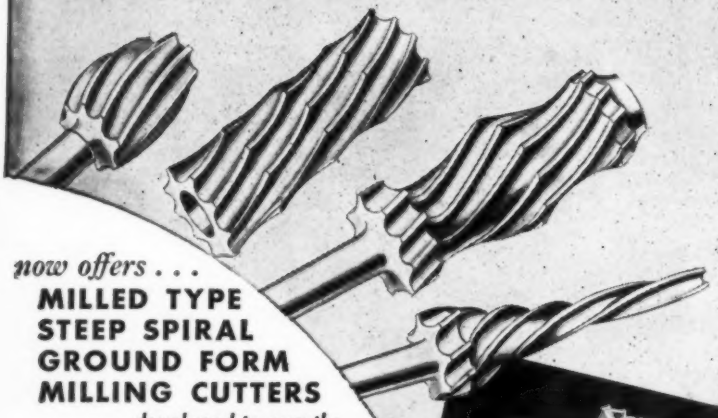
Now! High speed grinders made to the top quality standards of all WYCO Flexible Shaft Equipment. Can be used on bench, hung from hook or even from your belt. Shafts have WYCO patented Non-metallic Innerliner for smoother running and longer wear. Models for light, medium and heavy service.

No. 00-U—¼HP—10,000 RPM; 4 ft. shaft, takes ¼" collet.
No. 000-U2—1/12 HP—10,000 RPM; 3½ ft. shaft, takes ⅛" collet.
No. 000-U1—1/18 HP—10,000 RPM; 3½ ft. shaft, takes ⅛" collet.
Handsome metal case for grinder, including Standard Kit of 6 assorted accessories—only $6.50 additional. WYCO Catalog shows large assortment of accessories for use on these machines.

Makers of Profit Producing Tools!

WYZENBEEK & STAFF, Inc. 841 W. HUBBARD ST. CHICAGO 22, ILLINOIS

MOTOR TOOL *has done it again!*



now offers . . .

MILLED TYPE STEEP SPIRAL GROUND FORM MILLING CUTTERS

developed to exactly fit your requirements

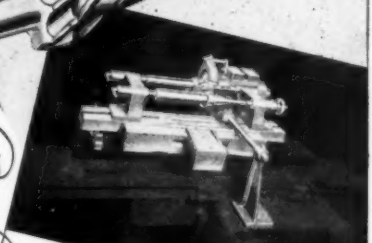
Steep spiral, milled type ground form milling cutters have not been produced in the past because no simplified means previously has been perfected for keeping them SHARP.

***Now*—MOTOR TOOL has developed a fixture for standard cutter grinders that keeps them razor sharp and true.**

As a result we are in a position to design and build such cutters up to and including 30-degree angle, right and left hand—with radii and angles of forms in either arbor or shank type construction.

Mail us blueprints of parts you want to mill. If arbor type, specify size of hole. If shank type, indicate shank dimensions. Price and delivery date will be promptly furnished.

Plus



a Means of Keeping Them
SHARP • FORM CONSTANT • TRUE

We do not advocate purchase of this NEW sharpening fixture unless you have sufficient volume to keep it busy. We will sharpen your cutters for you. 24 hour service if the need is urgent.

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METAL CUTTING TOOLS

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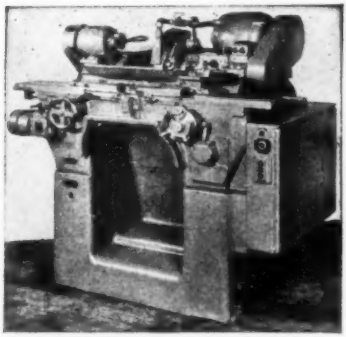
Make it a Rule to Call Motor Tool

One Company's Trend In Machine Tool Wiring Methods

By A. L. KRAUSE*

THE manufacture of machines in production rather than in the manufacture of special machines is our primary concern. This makes our problems different from those of the manufacturer of special purpose machinery. It is believed, however, that a few things being done with enclosures, conduit wiring and solenoids will be of interest as well as some of the general investigations that have been made on terminal joint insulation.



Separate electrical equipment enclosure mounted on plain grinding machine. Includes oil tight push buttons and selector switches.

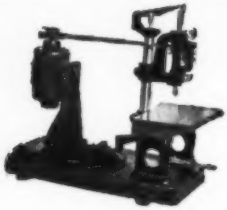
We are not in complete accord with those who feel it is undesirable to use the cast machine base as the control enclosure. Certainly no other arrangement can give the same degree of mechanical protection against damage by trucks. At the same time an enclosure in a machine requires the minimum of floor space and offers less interference in the operation and set up of the machine.

On any new design or redesign the present practice is to locate all control units in one enclosure. Room must be available for the disconnect switch and the control transformer. Generally, new cycles are added or additional machine functions electrified. All this means larger panels and enclosures. Our machines are a relatively small type of machine tool and the increase in panel size has in some cases made it impractical to find sufficient space in any one suitably located casting. This makes it necessary to use a separate enclosure. The use of a separate enclosure permits mounting the equipment at a greater distance from the floor which is a very desirable feature. In general it has not proved practical to make the distance from the floor to the bottom of the enclosure 24 inches, but where such specifications are insisted upon, it is frequently possible to use brackets and to relocate enclosures. Such relocation is apt to mean more floor space as interferences encountered in moving the top of the enclosure above the machine working surfaces requires it to be spaced away from the machine.

For multiple motor starters the standards specify that the enclosures shall not be less than No. 14 USS gage if of sheet steel. This is based on the group fusing requirement. For reasons of

• • •

*From a paper presented at the Westinghouse Machine Tool Forum by A. L. Krause, Electrical Engineer Brown & Sharpe Manufacturing Company, Providence, Rhode Island.



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INCREASE PRODUCTION
ON DRILLING
Small Precision Holes

THE Lord & Davis Supersensitive Drill Press saves money for you because it cuts production costs and increases your output. It gives you maximum accuracy on small hole production drilling.

A floating spindle under supersensitive control permits the drill to be fed with an ounce of pressure. The operator can easily feed the drill at the exact rate required. Consequently, drill breakage and work spoilage are eliminated and production costs cut down. Easy operation reduces operator fatigue and steps up production. Accurate drilling of small holes is assured.

For more accurate and more economical drilling of small diameter holes, use the Lord & Davis Supersensitive Drill Press. Save money . . . get better work . . . and more of it. Write today for folder.

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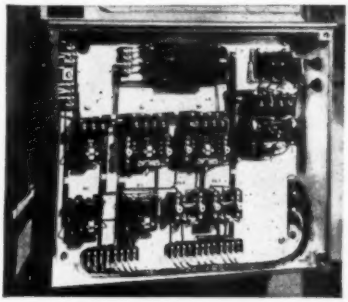
mechanical strength and rigidity we have standardized on No. 12 gage sheet steel for enclosures. Panels are fastened on to welded bosses having blind tapped holes. The enclosure mounting screws pass through welded bosses having counterbored holes in which are placed lead washers to act as seals. In general, all conduit holes are clearance holes. To adequately seal these openings an asbestos-like sealing washer (Durabla) is used between the inside lock-nut and the cabinet wall. Experiments have shown that these washers, when properly applied and used as a conduit seal, can hold kerosene spindle oil in a small container indefinitely. The standard locknut does not always show itself to the best advantage. For this reason consideration has been given the manufacture of our own locknuts with accurately cut threads and a better bearing surface for the sealing washer.



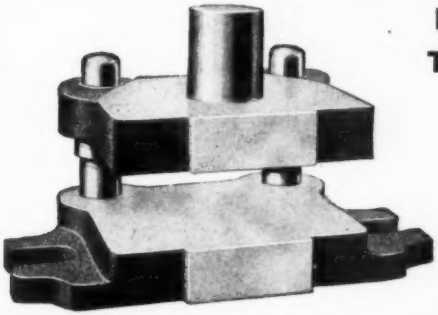
Inside view of enclosure showing sealed conduit entrances. Note lead sealing washers are used on enclosure mounting screws.

The cover hinges are of the continuous type. The covers are fastened closed with screws through counterbored holes so that a pin can be provided to prevent the removal of the screw. This gives greater assurance that the cover will be fastened. The felt seal is mounted in the cover and bears against the flange on the box.

All screws used for attaching control devices to the panels, the panel to the enclosure, and the enclosure to the machine, are plated to prevent corrosion.

PRODUCTO PRODUCTO

WHAT OUR INSPECTION MEANS TO YOU



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Every factor in construction and material used is carefully checked before shipping . . . saving you time and money by eliminating any error.

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- ★ **Complete Die Set agrees with specifications.**
- ★ **Correct length of pins, style of bushings as ordered.**
- ★ **Diameter of punch holder shank as ordered.**
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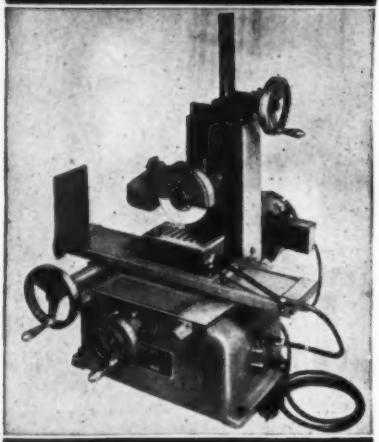

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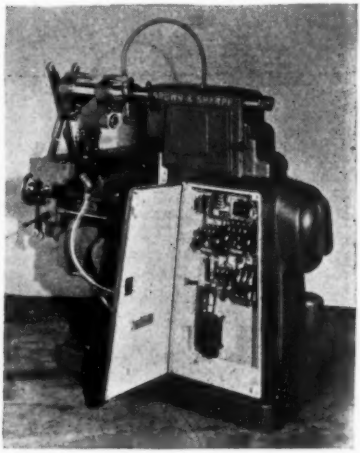
This is in line with the policy established by the electrical manufacturers.

The cover mounted type of disconnect switch handle is now standard for the reason that parts adjacent to the enclosure might make it impractical to have the disconnect handle on the side of each box. This does have the disadvantage of requiring a fixed location for the disconnect with respect to the cover and on deeper enclosures requires the disconnects to be mounted on spacers. With the disconnect handle in the cover the hinges can be on either side.



Electrical enclosure on milling machine shaped to conform with machine lines.

To provide the greatest visibility the inside of the enclosure and of the cover are both given a coat of baked white enamel. A welded on data pocket inside of the cover holds the necessary diagram.

To adequately protect against an accumulation of coolant which might run down from the top of the enclosure, the top is extended to form a drip lip to carry any liquids to the radius of the cover and then down the outside. This also insures against particles or chips resting on top of the cover and falling inside when the cover is opened.

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The enclosures are built in the metal fabricating department, and after receiving a priming coat and the inside finish of baked white enamel, are shipped to the panel department where the wired panel bases are installed. On one machine an arrangement is used that has proven to be very satisfactory. The various wires which are required for the complete wiring of all motors and limit switches are placed in the enclosure so that when delivered to the machine the electrician has everything but the conduit available in the single enclosure.

The conduit is all cut to length, threaded and in most instances assembled to the various conduit fittings in the pipe shop. Where a conduit assembly consists of a number of sections together with fittings, the pipe shop is furnished the overall dimensions of the assembly rather than the individual conduit lengths. This is necessary because of the variation in tapped holes in the fittings and the possible substitution of fittings of different make. Where the installation of such conduit assembly in one piece is not practical, hand tightened joints are furnished

Brown & Sharpe Mfg. Co.'s Test of Retaining Means for Solenoid Plunger Connecting Studs. Table No. 1

TYPE OF FASTENER	CATALOG NUMBER	NO. OF STROKES	REMARKS
COTTER PINS	3/32 BY 3/4	7,200 8,400 9,750 11,700	COTTER PIN BROKE COTTER PIN BROKE COTTER PIN BROKE COTTER PIN BROKE
WALDES TRU ARC EXTERNAL RING	NAS 51 RING #31 (5/16")	6,400 7,450 11,800 13,395	RINGS BROKE RINGS BROKE RINGS BROKE RINGS BROKE
ELASTIC STOP NUTS	42TE054 (5/16"-24 STEEL)	13,500 30,040 30,600	STUD FAILED. NUTS TIGHT AGAINST PLUNGER.
ELASTIC STOP NUT	5/16-24 (THIN STEEL)	201,000	NUT TIGHT AGAINST STUD SHOULDER, (CAME OFF)
ELASTIC STOP NUT	5/16-24 (THIN ALUMINUM)	424,000	NUT TIGHT AGAINST STUD SHOULDER. STUD BROKE.
RUBBER RING	GRATON I. KNIGHT O RING #6227-5 AN-HHP-114B	89,000 200,000 240,000 94,000	STILL IN GOOD CONDITION STILL IN GOOD CONDITION STILL IN GOOD CONDITION REMOVED AND INSTALLED ON MILLING MACHINE. REMOVED AND REASSEMBLED SEVERAL TIMES. IN GOOD CONDITION AFTER 500,000 CYCLES.

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CONWAY CLUTCH features:

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even though the dimensions apply to wrench tighten joints to insure proper fit at assembly. The thread on the end of the conduit where it passes through an enclosure must be sufficiently long so that it can be provided with a locknut on the outside and a sealing washer and a conduit bushing on the inside. The desirable thread is somewhat longer than the available thread on the standard taper pipe tap. This is particularly true where the conduit might pass through a cast wall behind the enclosure and where a locknut might be used on the inside of the wall. For this condition a straight pipe thread on the conduit is used. Continuous running straight pipe thread is also used to an advantage on some short nipples. This is cut in the pipe shop to overcome variations in pitch diameter of purchased thread conduit.

Until this threading operation was started, it was not realized there were so many different standard straight pipe threads. The so-called NPSM or American National Straight Pipe Thread for Mechanical Joints has been selected for this purpose. These threads are all cut to limits as determined by go and no-go gages. Except when cutting individual pieces of conduit it is not satisfactory to use a conduit fitting as a gage.

Standard tapered pipe threads are, of course, used with conventional fittings, but the NPSM straight pipe thread (external or internal) will make up satisfactorily with corresponding standard taper threaded holes or conduit. A much better seal can be obtained with a straight pipe thread passing through an enclosure clearance hole than with a taper pipe thread due to the better average engagement of the locknut.

Solenoid Plunger Pin Retainers

Complaints have been received when solenoids are used for clutch shifting. These were brought about because of the failure of cotter pins used to retain the connecting stud that fastened the operated mechanism to the solenoid plunger. It was first felt that this was due to the sharp edge of the hole shearing the head from the cotter pin, therefore, the holes were countersunk. When

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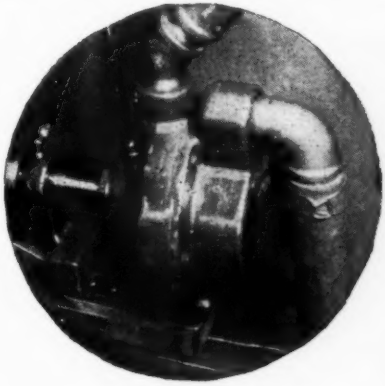

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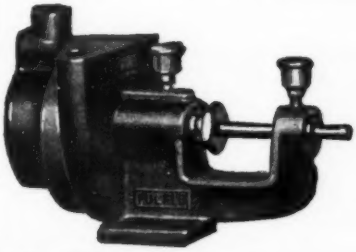

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this did not correct the difficulty a series of tests were made (Table I). It must be remembered that these tests are accelerated life tests and should not be considered as the normal expected life. The solenoid plunger operated against practically no spring load so that it attained very high velocities and the solenoid was mounted on a solid base. It was found that the cotter pins failed in a number of ways. They would shear off at either end and even break in the middle. Ends which were slightly bent would straighten or bend completely around the stud depending on whether they were on the top or the bottom of the stud. As shown in the tabulation, failures occurred in from 7 to 11 thousand operations.

A set-up was then made using a grooved pin in which was placed Waldes Tru Arc External Rings. These rings have proven very satisfactory on many applications. However, on the test set-up the shock was so severe that the rings broke in from 6 to 13 thousand operations. These rings have enlarged ends, each of which has holes to facilitate removal. The inertia of the enlarged end caused the breakage.

Consideration was given to the use of rubber "O" rings, but it was felt these did not look like a good industrial job, so a standard steel Elastic Stop Nut on a threaded stud with the nut brought up against the plunger was tested. The studs failed in from 13 to 30 thousand operations.

Not knowing if the failure was due to the expansion of the plunger or the inertia of the nut, both thin steel and thin aluminum nuts, with the nut brought up against a shoulder on the stud, were tried. The thin steel nut lasted 200,000 operations and then loosened. The thin aluminum nut test ran 424,000 times and the stud then broke at the shoulder.

In the meantime tests using a synthetic oil proof rubber "O" ring of the type normally used for hydraulic seals and packing were run. A groove was provided in the stud for holding this rubber ring. Separate tests of from

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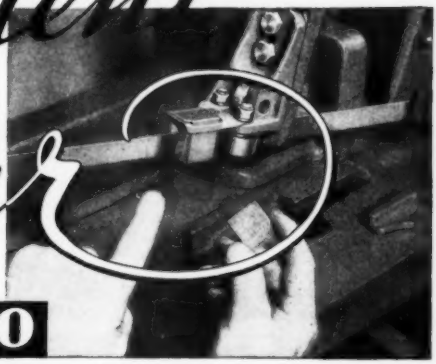
Efficient SAW TOOTH Cleaner with the KALAMAZOO



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The brushes fit into a special holder and may be reversed or quarter-turned for even wear and to prevent matting. Eliminates faults of stationary or rotating type of brushes that wear unevenly and must be constantly replaced.

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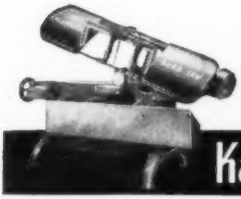

MACHINE TOOL DIVISION
KALAMAZOO TANK & SILO CO., Kalamazoo 16, Mich.
In Canada — Bridge Machinery Co., Montreal

Kalamazoo *Metal Cutting* Band Saw

90,000 to 240,000 were run with everything remaining in good condition. The final test was interrupted after 94,000 operations and placed in a machine on a solenoid operating clutch. During the course of tests it was removed and reassembled several times. It was still in perfect condition after 500,000 operations.

It should be remembered that these tests represent the worst possible conditions and resulted in the destruction of a number of solenoids. In general the solenoids would last from ¼ to ½ of a million operations.

Terminal Joint Insulation

It is felt there is one part of our machine tool wiring has improved very little and this is the taped joints generally used in motor terminal boxes. With the exception of gasketed boxes used on some totally enclosed motors, the box enclosures for these joints provide the poorest protection on a machine tool, and the joint is possibly the most vulnerable spot. The type of plastic insulation currently used on wires can withstand any oil seepage that might be encountered in a motor terminal box, but this cannot be said for the insulation used on the terminal joints.

Frankly, the proper solution is not known, but your reactions to some thoughts along this line will be appreciated. Originally conventional rubber and friction taped joint were used. About 7 or 8 years ago, as an added protection against oil, all joints were dipped or painted with a Glyptal oil resisting varnish. Our current machine tool electrical standards specify that joints must be, "covered with varnished cambric or oil resisting synthetic tape equal to wire insulation specifications and approved friction tape plus a coating of oil resisting varnish".

It seems as though there should be a better way of insulating a joint. There are a number of problems involved. These include; adequate mechanical protection against abrasion and pressure, protection against oil and moisture, ease of assembly and, to make the

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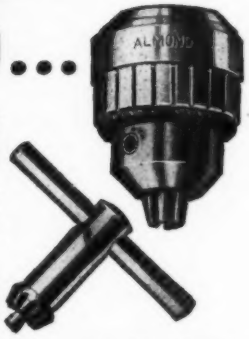
Triple Jaw DRILL CHUCK



The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine developments.

Almond Chucks are furnished in nine sizes with capacities from 3/16 to 1". They are made for heavy and light duty types with taper or threaded arbor hole — to fit all machine tools and portable tools.

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Here are ten main features to help you judge how well the Johnson bandsaw can serve you . . .

1. Large Capacity: 10" High x 18" Wide. Cuts small and large diameter stock — smoothly, evenly.

2. Three Point Base: Firm anchorage always assured. Bed cannot absorb strains caused by uneven floors. Twistproof.

3. Rigid Box-Type Frame: No wearing through friction. Oversize bearings and shafts throughout. Blade tension is uniform. *Guides are wide — stay adjusted.*

4. Bed is Wide and Deep: Accurately machined — all component parts work from common machined surface. Upper frame moves on large pivot bar through bed.

5. Quick Acting Vise: A time saver — takes a moment to lock workpiece in place.

6. Hydraulically Controlled: Frame descends gently on oil cushion. Hydraulically stopped at any height.

7. Four Speeds: 35, 90, 130, 190 feet per minute. You are sure of the correct speed for best results and fastest production.

8. Centralized Controls: No needless steps —all operated from front of machine.

9. Long Blade: 11' 5" long. Never heats. Most economical length to buy.

10. Portable: Self-contained. Plug in anywhere. Casters available.

Wet attachment available

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electricians task a little easier when packing joints in the terminal boxes, a smaller overall size.

It was felt that a tape without an adhesive would be much more difficult for an electrician to handle so samples of vinylite and neoprene tapes with adhesive backings were obtained. Various types of taped joints were made up. After preparing the joint it was immersed in a kerosene base spindle oil, held at a temperature of 60° C.

Friction tape plus neoprene or vinylite tape that was not treated lasted only 2 or 3 days. A joint treated with clear glyptal lasted only 7 days.

Next, stripping lacquer was obtained. These lacquers have been developed for protecting metal parts against corrosion while in storage. Joints made up of vinylite or neoprene plus friction tape treated with one or two dips of stripping lacquer in general were still good after a couple of months immersion. When no friction tape was used, a vinylite or neoprene tape tended to creep, breaking the seal and thus exposing its adhesive to the action of oil.

After making up a few of these test joints and seeing the results, it was realized that any method of insulating with tape would, at the best, always be a rather crude job. As you know, it is rather difficult to make a smooth tape protective covering over the end of the joint. The results are entirely at the mercy of the electrician. This prompted consideration of the possibility of making a boot out of a synthetic oil resisting rubber. This would replace the first layer of tape. The boot could have a thin wall and a heavy end section to make it unnecessary to bring the friction tape over the end of the boot. The final layer of tape would then supplement the side wall protection and help hold the boot on.

Test boots were made by one of the local rubber companies. A Medium Size Renier's Nasal Specula was chosen from the medical equipment in the infirmary as the most likely tool to expand the boot while it was being applied. When tested with the various tapes, it was found these reacted in the same general

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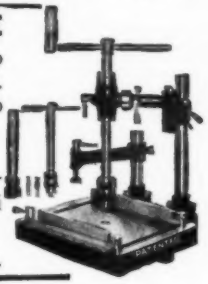


WOLCO TOOL DIVISION **725 Custer Evanston, Ill.**

manner as when used alone on joints, but that the boots remained unaffected by the oil. After experimenting for a while, it was felt that the tape was superfluous, and so more boots were ordered. These with heavier wall sections and a rib around the open end to help keep it in position.

The boot might be criticized on the grounds that it can be rolled back thus exposing the live terminal. If it cannot be made to prevent this, it may be necessary to add some tape to the boot or to tie it. A more appropriate shaped tool could be used than a "Nasal Specula" and some type of lubricant may be necessary to facilitate installation. However, it does appear to have the following advantages:

a. A neat compact joint (smaller joints mean less pressure on the insulated terminals in any given terminal box).

b. Uniformity (the electrician need only select the proper size boot and the insulation of the joint does not vary depending upon the electrician's ability).

c. Neoprene is resistant to oil and abrasion.

d. With a proper tool, installation time should be less.

It may be felt that a change in the present method of insulating terminals is not desirable. It is recognized that the use of a special tool is objectionable, but the idea is that it would find its primary use in production.

VICTOR PACK TYPE EMERGENCY FLAME CUTTING OUTFIT

The Victor Equipment Co. has announced the availability to industry of the Victor Pack Type Flame Cutting Outfit which was originally designed and produced for the Navy. It is carried on the back in a well-fitting canvas bag with the hand cutting torch so supported in the harness that it may be easily removed for cutting operation. The regulators are preset to suitable oxygen and acetylene pressures. The outfit includes goggles, leather gloves, spark lighter, hose, cutting tips and wrenches besides the unit itself.

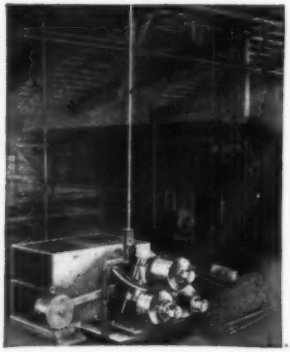
"I say it to you in deadly seriousness: We in business must liberalize or face the threat of economic liquidation. The law of life applies: Adapt or die. We can't run away from destiny down some secluded rabbit trail."

—Eric Johnston

Praise, like gold and diamonds, owes its value to its scarcity.

Luncheon Speakers at the recent Westinghouse Electric Corp.'s Machine Tool Forum in Pittsburgh. Left to right: F. S. Blackall, Jr., President, The Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island; L. W. Scott Alter, President, American Tool Works, Cincinnati, Ohio; and W. P. Kirk, President, National Machine Tool Builders Association, West Hartford, Connecticut. Luncheon Speakers.

PUTTING AN *Upward Curve* in PRODUCTION



Don't let a curve in a piece of metal put your production on a down-hill slide! Instead, put an *upward* curve in production by the use of a Buffalo Bending Roll — as hundreds of cost-wise plant managers are doing!

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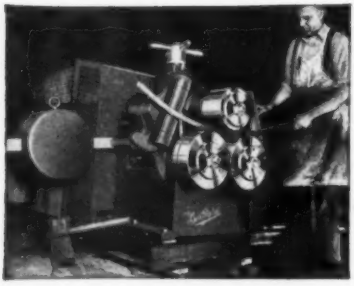


If you haven't seen Bulletin 352-B which gives the whole story, send for your copy.

BUFFALO FORGE COMPANY
161 Mortimer St., Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd.,
Kitchener, Ont.

"Buffalo" **BENDING ROLLS**

Adjustable Voltage Drives Case Histories and Practical Applications

By W. B. WIGTON*

THE economics of present day manufacture calls for machine tools that will lower production costs in order to offset increased material and labor costs. This is especially true now, when many items are sold under a fixed ceiling.

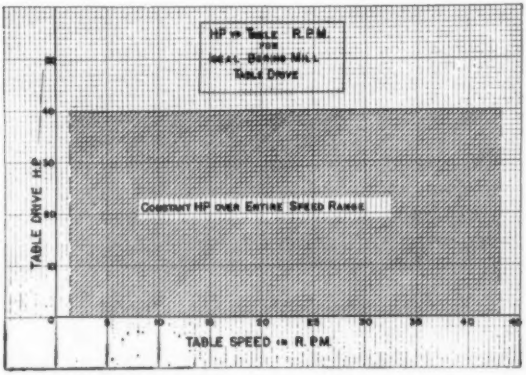


Figure 1—Hp vs table rpm for ideal boring mill—table drive.

In the vertical boring mill field, the electrical manufacturer has given us a tool to help meet this economic challenge to profits. This tool is the adjustable voltage table drive. To properly appreciate the advantage of this drive, we should first establish some rough standard of performance or "yardstick" of what we desire in an ideal drive, and then see how closely we can approach this ideal with our adjustable voltage drive.

First, let us set up the characteristic curve of the ideal drive. In general, we can roughly divide machining into (a) machining with high speed steel tools: (b) machining with carbides. In machining with high speed steel tools, which use the lower speed range of the boring mill table, general machining practice seems to be to increase tool feeds as tool cutting speeds are reduced. This would indicate that constant horsepower would be desirable over the lower speed range of boring mill table speeds. In machining with carbides, which usually is done at relatively higher speeds, the feed is usually lighter than with high speed tools. Also, machine losses increase as the machine is operated at higher speeds. In general, therefore, the requirements for machining with carbides also seem to be satisfied by a constant horsepower drive. Obviously, this conclusion has not been worked out by strict mathematics, which may show variations; however, past practice has shown the constant horsepower approach to be conservative from both an application and operation standpoint, on boring

• • •

*From a paper presented by W. B. Wigton, Electrical Engineer of The Cincinnati Planer Company, Cincinnati, Ohio, at the Machine Tool Forum held at Westinghouse Electric Corp., Pittsburgh, April 9 and 10, 1946.

mills for general purpose duty.

Figure 1 shows the horsepower speed curve of this ideal drive. At a glance, it can be seen that this ideal drive develops constant horsepower over the entire range of boring mill table speeds. Obvious, also, is the fact that the speed increments are infinitely small. Implied in this curve is the fact that the entire table speed range is covered without gear change.

Now, let us look into the past, and see how the performance of various drives compares with the ideal curve, Figure 1.

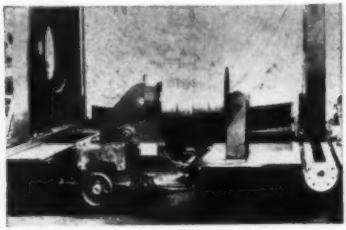
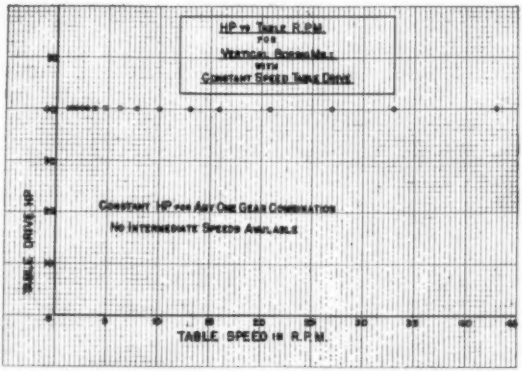


Figure 2—Old style boring mill with countershaft table drive.

Figure 3—Hp vs table rpm for vertical boring mill with belted countershaft table drive.



One of the oldest types of drives, which many may have seen, was the belted countershaft drive. A common countershaft, running at constant speed, powered several machines through step pulleys and flat belts. Figure 2 illustrates one of these old mills, viewed from the rear in order to show the step pulley. Figure 3 shows the horsepower-speed characteristics of this type of drive. It was assumed that the countershaft pulley had four steps, and that each of the 16 combinations transmitted constant horsepower.

The countershaft drive was superseded by the individual drive for each machine. Figure 4 shows an early boring mill equipped in this fashion. With the direct current motor shown, gear changes were employed in conjunction with motor speed variation over a 2:1 range. Figure 5 shows a later change, in which the motor was moved "downstairs", and V-belts were employed.

The characteristic curve of this d-c drive is shown under Figure 6. The gaps in the curve have been reduced, and the curve is approaching that of the ideal. However, some gaps still exist, and certain speeds in these ranges are unattainable. Also, gear changes must be used, in order to cover the complete operating range of table speeds. In its favor is the fact that the horsepower is constant over a limited range of motor speed variation, made by adjusting the motor speed over its 2:1 range by a manually operated rheostat.

With the widespread use of alternating current, boring mill table drives inevitably changed to the constant speed, squirrel cage, induction motor with the necessary gear changes to cover the required range of table speeds. By comparing the chart of Figure 7 with that shown in Figure 3, it is obvious that our progress has gone around in a circle, for we started with approximately 16 definite speeds, and, at this point, we return to 16 definite speeds. We should not conclude from this statement that our progress has been zero. Great progress

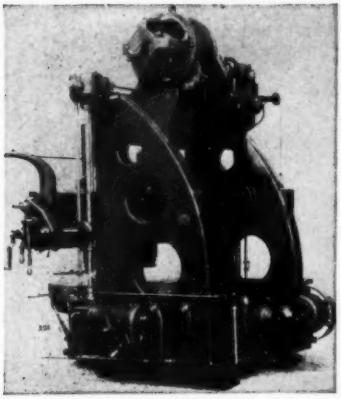


Figure 4—Old style boring mill with individual dc main drive motor, mounted on top of machine.

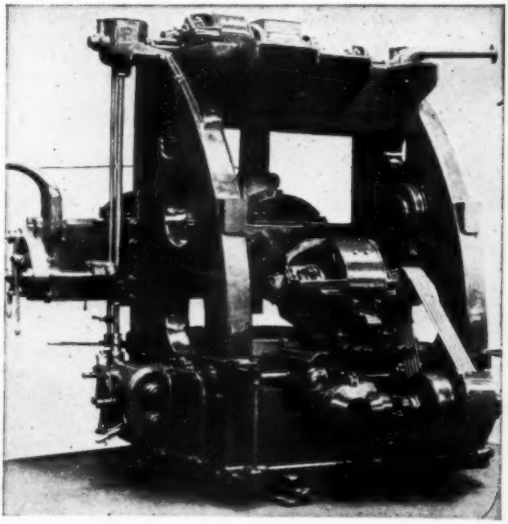
has been made in the mechanical design of the machine itself, so that, with its individual squirrel cage motor drive, lever control of table speeds from the operator's position, individual traverse to each head, and many other improvements, this boring mill was and is a very fine, accurate, dependable machine tool. Figure 8 shows the present day boring mill, equipped with a squirrel cage motor main drive and gear changes to give 16 definite speeds.

Figure 5—Old style boring mill with individual dc main drive motor, mounted on bed of machine.

The impact of the recent World War, with its emphasis on maximum production, opened the door for the application of the adjustable voltage drive to boring mill table operation. In principle, there is really nothing new about this drive, for it has been encountered under the name "Ward Leonard" in past studies. However, a short review of its horsepower-speed characteristics might be in order.

If we were to apply an adjustable voltage drive without any gear changes to a boring mill table, the characteristic curve would be as shown in Figure 9. With a 20:1 overall speed range, the drive represented provides an adjustment of 3:1 by motor field weakening and the remainder by generator field control. As the curve shows, constant horsepower is available over the 3:1 range of speed adjustment, and horsepower proportional to speed over the remainder of the range. While the curve is shown for a drive applied to a boring mill, it represents, equally well, the general characteristic of all adjustable voltage drives.

The drive, as applied in Figure 9, would not be successful for general purpose work. In the lower end of the speed range, the horsepower available would not be sufficient for heavy machining. However, this application is



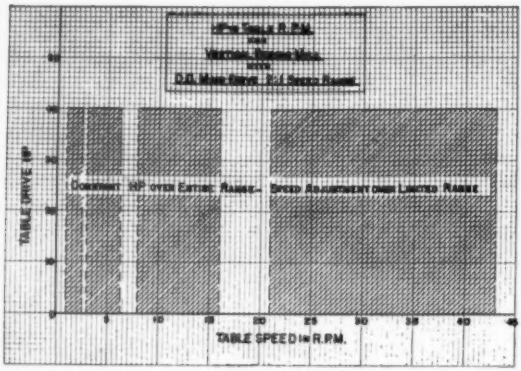


Figure 6—Hp-speed characteristics of boring mill with dc table drive, 2:1 speed range.

one step closer to the "ideal" drive, represented by Figure 1.

Now consider the effect of applying one gear change in the gear train between the adjustable voltage drive and the boring mill table. Figure 10 shows the characteristic curve of this arrangement. The upper speed range, normally used for general purpose machining, extends from 43 rpm to 2.15 rpm. This curve, is exactly the same as that of Figure 9. By shifting one back gear, and returning the rheostat to its top speed position, we again have a 20:1 range available, from 10.7 rpm down to 0.5 rpm. By comparing the curves of Figure 10 and Figure 1, it is obvious that the curve of Figure 10 is approaching the ideal. Several gaps still exist in the curve of Figure 10, but these are merely gaps of reduced horsepower, instead of gaps in which certain speeds are not available.

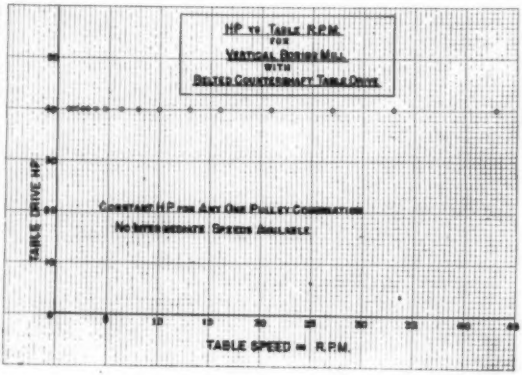
One feature which makes this drive very attractive is that, for work requiring horsepower within the limit of the curve, it is possible to adjust table speed over approximately the whole working range of boring mill speeds, without changing gears. This range is ordinarily satisfactory for general purpose machining; for machining of hard materials, or machining heavy cuts at slow speeds, the mill may be shifted into "low gear".

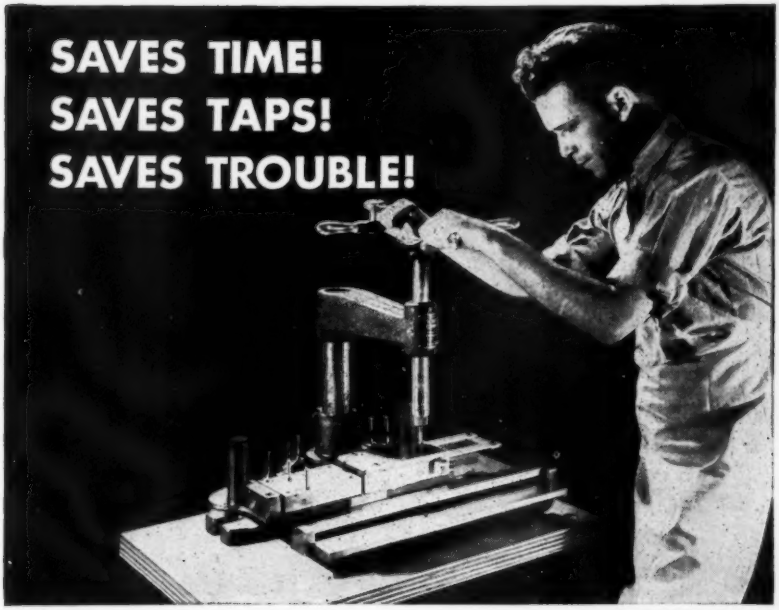
On applications in which no dips may be tolerated in the horsepower-speed curve, a drive with a wider speed range which can be obtained by field weakening (constant horsepower), may be used. Later we will see the effect of using a 6:1 motor. Ordinarily, however, the 3:1 drive is satisfactory, when applied with the proper gear change ratio.

The selection of the proper gear change ratio is important. In Figure 11 is shown the effect of various gear shift reductions on the horsepower - speed characteristics of both a 3:1 drive and a 6:1 drive.

With the 3:1 drive on the left hand side of the page, the upper table speed range is shown at the top of the page. A comparison with the lower speed

Figure 7—Hp-speed characteristics of boring mill with constant speed a-c main drive motor.





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ranges shown below it for gear reductions from 2:1 to 6:1 inclusive, shows the effects of changing the "back gear" ratio. The 2:1 gear ratio is wasteful, since it causes an overlap of the constant horsepower ranges to no advantage. With the 3:1 gear reduction, the gap appears only in the lower end of the boring mill range. This combination would be weak on heavy cutting at low speeds. The 4:1 ratio seems to divide the

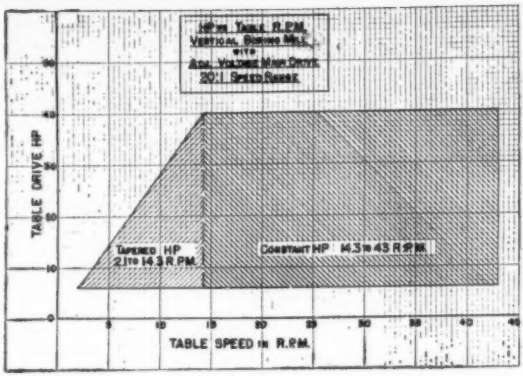


Fig. 9—Characteristics, adjustable voltage drive.

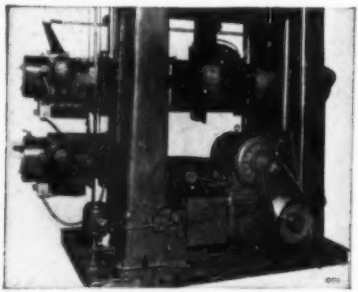


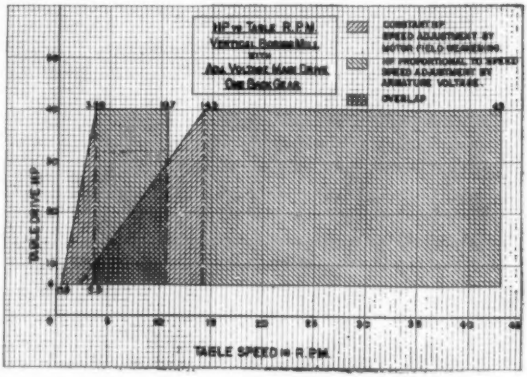
Figure 8—Present day boring mill with constant speed a-c table drive motor.

tapered horsepower regions very nicely into two sections, so that neither section is too weak. The middle dip in the curve would reach a low point of 30 hp at about 10 rpm, which should not be objectionable. By checking the curves of the 3:1 and 2:1 reductions, it can be seen that the reduction in horsepower in the middle dip is excessive. Therefore, the best overall ratio for general purpose work seems to be the 4:1 gear ratio, when used with the 20:1 overall range, 3:1 motor range drive.

Inspection of the characteristic curves of the 6:1 drive, on the right hand side of Figure 11, will show that the 6:1 gear ratio should be used only for special purpose applications. Generally, the expense of the 6:1 motor cannot be justified only in special cases.

In Figure 12 is shown a modern vertical boring mill equipped with an adjustable voltage drive. Complete details of the electrical equipment are not shown in this photograph, but will be shown in a later view. Quite obvious,

Fig. 10—Characteristics, A-V, M.D. and one back gear.



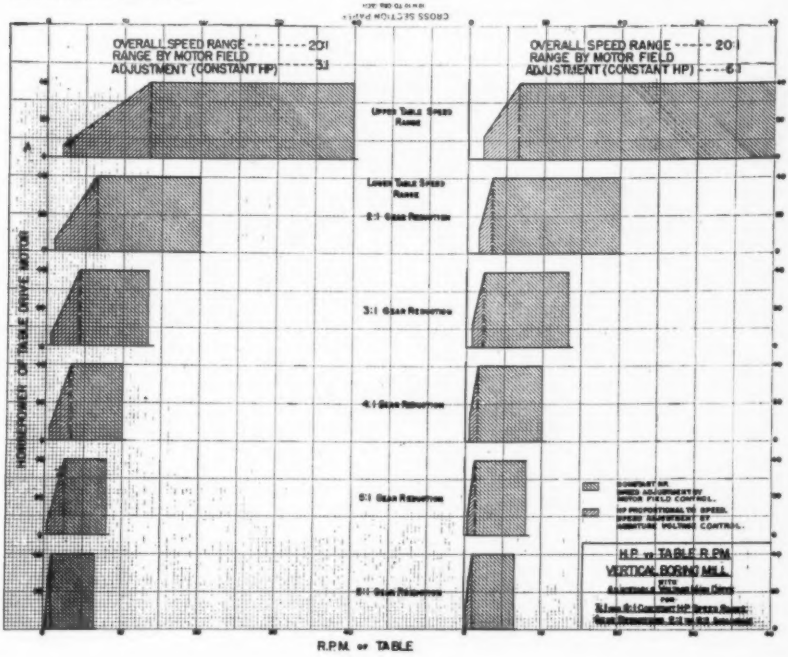
however, are (a) the single gear shift lever on the right hand side of the bed, and (b) the dial of the rheostat, which controls the table speed adjustment. This rheostat is motor-operated, and controlled from two buttons in the pendant station.

The adjustable voltage drive boring mill has many advantages over its chief competitor, the constant speed drive mill. High on the list of advantages is production. To illustrate the increase in production which may be expected of a boring mill equipped with an adjustable voltage drive over a boring mill equipped with a constant speed type of drive, a study has been prepared and is shown in Table I. The example selected at random is a cylinder 5 foot in diameter and 5 foot high. To compute the time required to turn the outside curved surface of this cylinder, assume a maximum cutting speed of 200 feet per minute with a feed of ⅛ inches per revolution, and the use of one tool. It will be noted by following through the calculations that the speed of the table should be 12.7 rpm to achieve a cutting speed of 200 feet per minute.

Using the constant speed drive, the nearest speed which can be used without exceeding 200 feet per minute is 10 rpm. On this basis the turning job in question would require 48 minutes.

With the adjustable voltage drive, the speed of 12.7 rpm could be set almost exactly, and with this speed the cutting time would be 36.9 minutes. Therefore, the saving is 11.1 minutes, or approximately 23.1 per cent. It should be quite obvious that savings of this magnitude would very shortly pay for

Figure 11—Affect of various back gear ratios on hp-speed characteristics of boring mill with 3:1 and 6:1 dc main drives.



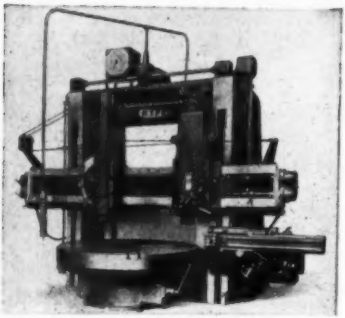
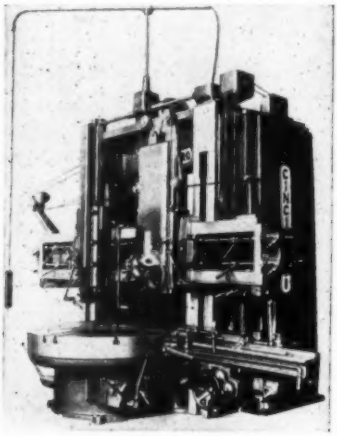


Figure 12—Conventional mill with adjustable voltage table drive.

the difference in price between the two drives.

On facing work, the adjustable voltage drive outstrips the constant voltage drive, because the operator may increase or decrease his table speeds continuously and without stopping the table drive, when machining from a certain diameter to a larger or smaller diameter, as the case may be. This is advantageous in finish cuts, where stopping the table is impractical because of the tool marking the work; or in heavy cuts where stoppage of the table with the tool in the cut might result in tool tip breakage with certain tipped tools.

Figure 13—Conventional mill with constant speed ac motor drive.



As a further aid to production, operator fatigue is lessened by the use of the adjustable voltage drive. Elimination of mechanical gear shifting has already been mentioned. The necessity of climbing up and down a platform, on high work, to shift gears, is eliminated, since speed changing is handled from the pendant station controlling the motor operated field rheostat. Finer inching for setup plus ability to inch the table in the reverse direction also saves labor on the part of the operator. Since the rheostat dial is visible from practically all operator's working positions, the operator is aware at all times of his table speeds, thus enabling him to concentrate more fully on the machining operation.

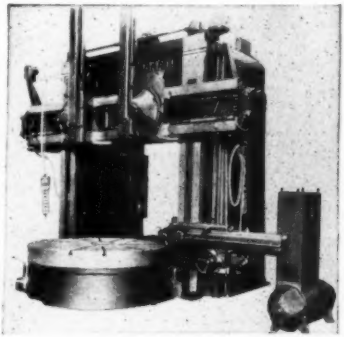


Figure 14—Adjustable voltage drive operating vertical boring mill.

When desired, it is possible to mechanically connect the heads and the rheostat together in such a manner that the table speed is automatically changed as the tool operates on greater or lesser work diameters. Where desired on machines equipped with turret heads, table speeds may be preset on individual rheostats for each position of the turret head, and automatically selected as the turret is moved into its successive positions.

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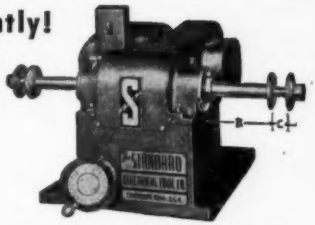

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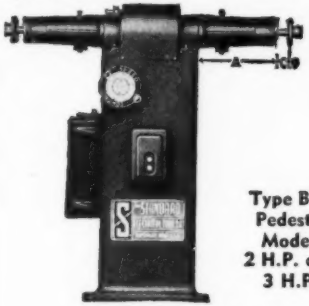
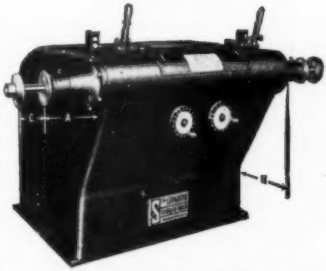


Type BVP Pedestal Model. 2 H.P. and 3 H.P.

Type RV 5 H.P. and 7½ H.P.



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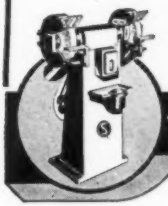

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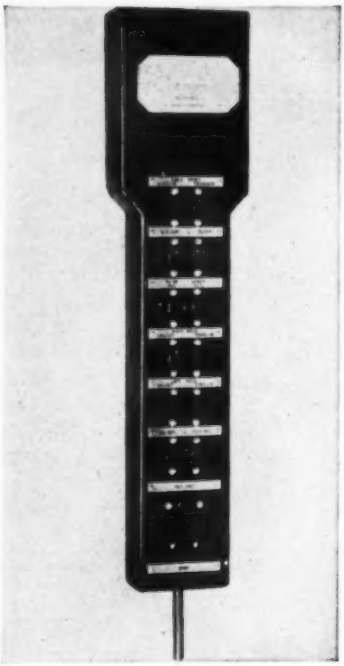


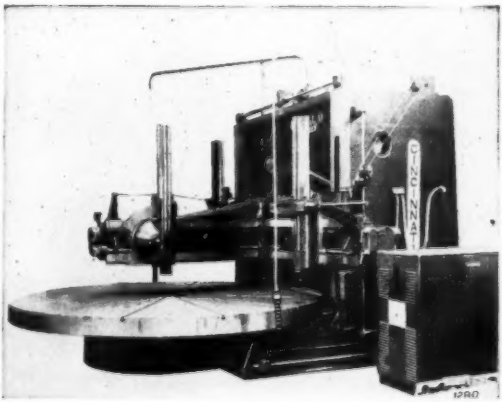
Figure 15—Boring mill pendant station with built-in tachometer instrument.

Figure 16—12'-18' diameter extension boring mill.

From a maintenance standpoint, we have substituted electrical for mechanical devices. The use of the single shift with the adjustable voltage drive reduces the mechanical devices from fifteen gears, two clutches, and four shifting linkages for the constant speed drive to seven gears, one clutch, and one shifting linkage for the adjustable voltage drive. The adjustable voltage drive has added a motor generator set and field rheostat, together with more complicated control. To offset this, however, we usually find electrical maintenance easier than mechanical maintenance, and also less costly, since it may be carried on exterior to the mill and can be made without disturbing the machine structure.

From a price standpoint, the price of the adjustable voltage, 3:1, constant horsepower drive is approximately 2 or 2½ times the price of a constant speed, squirrel cage motor drive. In actual dollars, this cost differential amounts to only about 5 per cent of the cost of the boring mill itself. From the information given above, it may readily be concluded that the adjustable voltage drive will save its original cost differential in a relatively short period of time.

Now let us look at a number of boring mills, as examples of the information already given you. Figure 13 shows a front view of a boring mill equipped with a constant speed AC motor drive. Notice the four gear shifting levers on the right hand side of the machine and the speed plate beside them. In contrast, refer again to Figure 12 which shows a similar mill except equipped with an adjustable voltage drive. On this latter mill, as previously explained, the motor operated rheostat has been mounted on top of the boring mill; also, the adjustment of this motor operated



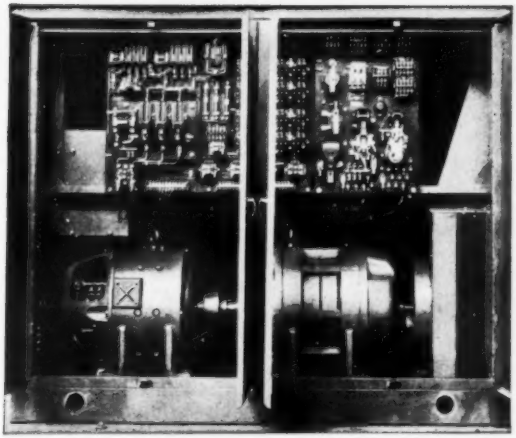


Figure 17—Close-up view, combination control unit for 12'-18' extension boring mill.

rheostat is controlled from two buttons in the pendant station, so that the table speed may be adjusted from the operator's position. Note the single gear shift lever on the right hand side of the machine. In general purpose work, this single shift lever is seldom used, so that we may say that for all practical purposes the table speed is controlled from the pendant station.

Figure 14 shows additional details of the adjustable voltage drive. The main drive motor is not visible on this picture, but the unit frame motor generator set, with control mounted above it to minimize floor space requirements can be seen. Also shown is the control for the auxiliary motors, which is mounted on the inside of the left hand housing. The pendant station is visible, with its tachometer instrument which indicates speed in conjunction with a tachometer mounted on the main drive motor shaft.

Figure 15 shows a close-up of the pendant station. This may be of interest to engineers, because of its built-in tachometer instrument.

Figure 16 shows a rather unusual type of boring mill. This is a 12'-18' diameter extension boring mill bought by a well known aircraft company during the recent World War. At the right hand side of the machine is seen a combination motor generator set and control. For ease of operation this machine is equipped with two pendant stations.

For large diameter work, the table which is shown on this photograph is used. Note that the housings are mounted on a track, and that the rail is equipped with an extension arm to bring one of the tools to the center of the table. For smaller diameter work, this table is removed, together with the extension arm, the housings are moved forward under power, and the mill is then a conventional 12' boring mill.

Figure 17 shows a closeup view of the inside of the combination motor gen-

Figure 18—Vertical boring mill equipped with milling head.

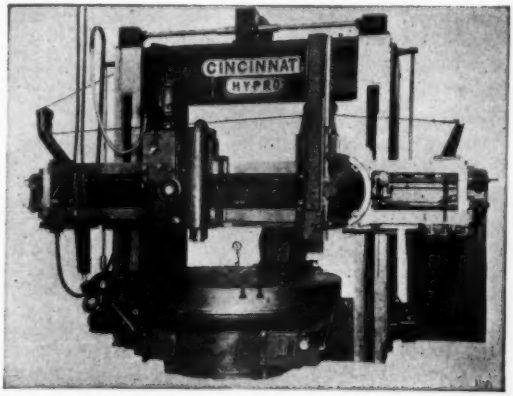


TABLE I
CALCULATION

Time for machining cylinder outside diameter on 7′ Boring Mill equipped with (A) Constant Speed AC Main Drive. (B) Adjustable Speed DC Main Drive.

Cylinder to be machined:

Assumed maximum cutting speed at tool: 200 feet per minute.
Assumed feed rate of tool: ⅛ inch per revolution
Desired speed of table: = Cutting Speed at Tool / Periphery of Cylinder

where

Cutting Speed is expressed in feet per minute.
Periphery is expressed in feet per revolution. Speed of table is expressed in R.P.M.

Table Speed = 200 Ft/Min. / 5 Ft/REV.

= 12.7 RPM

Total number of revolutions table must run = Height of Cylinder / Feed Rate

where

Height is expressed in inches.
Feed is expressed in inches per revolution.

Total table revolutions = 5 x 12 / ⅛

= 480

(A) Constant Speed A-C Main Drive:

Nearest lower table speed available = 10 RPM
Nearest higher table speed available = 13 RPM

Since 13 RPM will result in a cutting speed in excess of 200′/MIN., it is necessary to accept a **"Compromise"** speed setting, namely 10 RPM.

Total turning time = 480 REV. / 10 RPM

= 48 minutes.

(B) Adjustable Speed D-C Drive:

Because of small increment speed adjustments available with this type of drive, it is possible to secure exactly 13 RPM table speed, as required for maximum production.

Total turning time = 480 REV. / 13 RPM

= 36.9 minutes.

Time saved by using Adjustable Speed DC Drive = 48 min.—36.9 min. = 11.1 minutes

Per cent time saved = 11.1 min. x 100 / 48 min.

= 23.1%

erator set control unit, shown in Figure 16. On the right is a suction fan which pulls air in through a set of filters. The air is then exhausted out through the louvers on the other end of the cabinet. Thus, the control and motor generator set are kept free of dust and dirt. This type of enclosure and unit, while initially more expensive, will pay dividends in reduced maintenance expense, over a period of years.

Figure 18 shows a rather unique boring mill. This boring mill is equipped with a milling head and arranged so that this head may be slowly fed across the rail, its spindle may be slowly fed up or down, or the table may be slowly fed around. Any combination of these feeds may be operated at the same time as desired. This boring mill is located in one of our government arsenals.

Another unique application which has been made to boring mills is the application of an adjustable voltage, reversing, planer drive to a boring mill table. No photograph is available on this application. Several mills were built during the war for machining a small segment of a casting on which only a limited rotation of the table was permitted, because of a large segment of the casting reaching back between the housings. The table was equipped with dogs and a reversing master switch and operated in much the manner as a planer, except that the table oscillated back and forth on short stroke under control of the table dogs.

Looking into the future, we can predict that adjustable voltage drives will become increasingly more and more popular for driving the tables of vertical boring mills, and may ultimately approach the widespread use of this type of drive in the planer field.

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Disconnect Circuit Breakers For Machine Tool Control

By H. D. DORFMAN, A. B.*

THE thermal or thermal-magnetic circuit breaker adequately protects machine tool motors and control elements against damage from short circuit and overloads; in addition, costly production delays are avoided that are caused when a fuse blows and one of the proper size is not readily available for immediate replacement.

Several types of breakers are available on the market First is the thermal type the only unit which provides inverse time protection. This means that the lower the value of the overload, the longer the time it takes to trip the breaker; and conversely, the higher the overload, the shorter the time it takes to trip the unit. Second is the thermal-magnetic type. This combines the inverse time feature of the thermal element with the magnetic trip. As a result, extra fast action is provided under short circuit conditions. Third is the magnetic trip type, the only circuit breaker designed primarily for short circuit protection. Fourth is the non-automatic circuit breaker type which is used as a disconnect and is of particular importance to the machine tool industry.

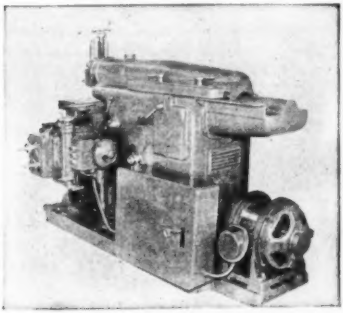


Figure 1—Machine tool with enclosure housing circuit breaker and control elements. Handle on cover is used to operate breaker.

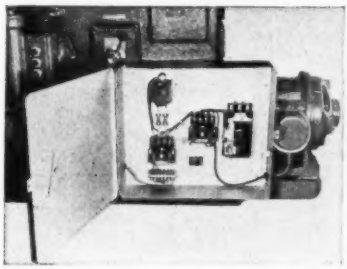


Figure 2—Interior of enclosure of Figure 1, showing location of breaker and control elements.

To enable the machine tool industry to use the circuit breaker with a minimum of inconvenience, a special handle mechanism has been developed as shown in Figures 1 & 2. As part of the new machine tool specifications a handle is required on the control cabinet which prevents the cover from being opened when the disconnect means is energized. This new mechanism serves this purpose In addition, it is equipped with a device that permits opening the cover by means of a screwdriver when the breaker is in the "on" position. This is a requirement of a few users who on occasions wish to make adjustments within the control cabinet while the machine is operating. The mechanism is slam-proof. In other words, the metal cover can be slammed without injury to the breaker handle regardless of the position of the handle. Provision is

• • •

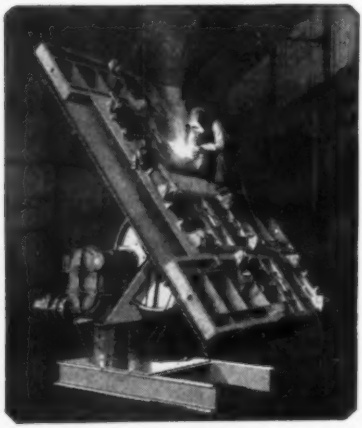
*From a paper presented at the Westinghouse Machine Tool Forum by H. D. Dorfman, Breaker Eng. Dept., Westinghouse Electric Corp., East Pittsburgh, Pa.

made for three locks in the handle when the breaker is in the "off" position. (Figure 3).

In the family of Westinghouse circuit breakers, there is a series of six that can be used on machine tools. These are available in different frame sizes, pole combinations, current and voltage ratings as indicated in Table I. It can be seen that the size of the breaker increases as the ampere capacity increases. This is to prevent an excessive temperature rise due to the amount of current the breakers must carry continuously.

As there are thermal, thermal-magnetic, straight magnetic, and non-automatic breakers, it seems advisable to explain the difference between them and where each is used. The thermal and thermal-magnetic breakers were designed for the protection of wire and are approved as such by the Underwriters' Laboratories, Inc., under their Label Service. In order to be approved by the Underwriters as a wire protective device the breakers have to meet the following requirements: the breaker must carry its rating (100% load) continuously at 25 degrees C

Figure 3—Control handle of circuit breaker locked in "Off" position.



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ambient temperature and trip out at some time on 125 per cent of its rating (50 amperes or less, one hour, and two hours for more than 50 amperes). On 200 per cent of normal load the breakers must trip in the time given in Table II to meet the Underwriter's requirements. The magnetic trip is added in order to trip the breaker out in time to protect the wire from overheating on short circuits above 5,000 amperes and is not a requirement of the Underwriters. In order to start motors, the magnetic trip must be set at least nine times above the normal current rating of the breaker. Magnetic breakers are not approved by the Underwriters as they do not meet the 125 per cent trip-out requirement. If a magnetic breaker would carry 100 per cent of load continuously and trip out on 125 per cent of rated load as specified Table II, the Underwriters would accept and approve it as a magnetic breaker.

However, in order to start motors the magnetic breaker must be calibrated at least 900 per cent above its rating. Adjustable magnetic breakers can be set anywhere from 125 per cent to 400 of their rating and, therefore, will not be accepted by the Underwriters for wire protection. This for the reason that when it is set on the high position there is a range of overloads from 125 per cent to 400 per cent where the breaker will not protect the wire. On fixed magnetic breakers the magnetic is generally calibrated 9 to 14 times the rating of the breaker in order to allow starting motors. This means magnetic breakers are only satisfactory for wire protection on overloads above the magnetic setting. For loads below the magnetic setting the wire is not protected except by the motor starter heaters, etc., and the Underwriters will not recognize this as protection for the wire.

The thermal-magnetic breaker protects all the way from 125 per cent of the rating and when the overload is lower than the magnetic setting the thermal trips the breaker in a time inversely proportionate to the overload current. In other words, a straight magnetic breaker, when it is set to allow the starting of motors, has a range of

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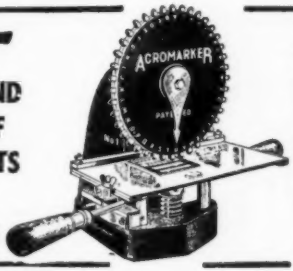

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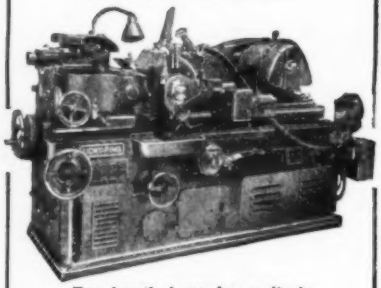

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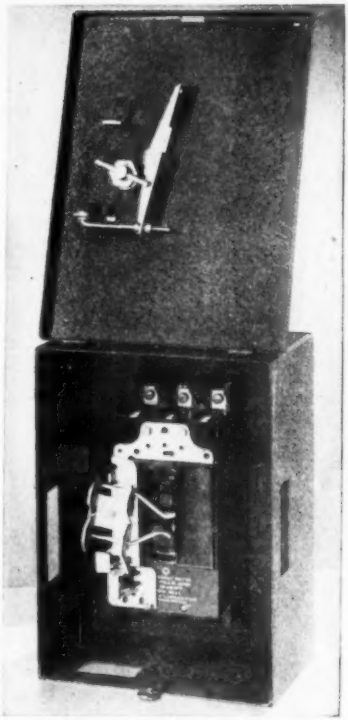

Figure 4—Interior of circuit breaker housing showing handle mechanism that makes possible operating the breaker when cover is in closed position.

current below the magnetic setting that is not protected, which is not true with a thermal-magnetic breaker.

A non-automatic breaker is little more than a high-class disconnect switch and is used for this purpose, requiring a protective device ahead of it in all cases. Thermal and thermal-magnetic breakers are applied for motor protection in the same way as the fuse, according to the National Electrical Code, Table 26 or 27. When magnetic trip only breakers are applied, it is for short circuit protection as these are not recognized for the protection of wire by the National Electrical Code.

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CIRCUIT BREAKER TYPE	AMPERE RATINGS	A-C VOLTAGE RATINGS	D-C VOLTAGE RATINGS	INTERRUPTING CAPACITY			CHECK MARK INDICATES STANDARD AND SPECIAL FEATURES										
							STANDARD FEATURES									SPECIAL FEATURES	
							TYPE OF TRIP							TYPE OF TRIP UNIT			
				UND. LAB. (AMPERES)	NEMA (AMPERES)	TIME IN CYCLES	QUICK-MAKE QUICK-BREAK MECHANISM	THERMAL ONLY	THERMAL MAGNETIC	MAGNETIC ONLY	NON-AUTO MATIC	ADJUST MAGNETIC	NON-ADJ. MAGNETIC	INTER-CHANGEABLE	NON-INTER-CHANGEABLE	SHUNT TRIP ATTACHMENT	AUXILIARY SWITCHES
QUICKLAG (1-POLE)	10-50	125	A-C ONLY	5,000	5,000 AMPS. A-C	¾ TO 1	✓		✓				✓		✓		
E FRAME (1-2 & 3 POLE)	5-70	125 (1 POLE) 250 (2,3 P.)	125 (1 POLE) 125, 250 (2,3 P.)	5,000	5,000 AMPS. A-C	¾ TO 1	✓	✓			✓				✓		
F FRAME (2 & 3 POLE)	5-100	250 AND 600	125, 250 AND 250	5,000 AND 10,000	5,000 AMPS. A-C / 15,000 AMPS. A-C	½ TO ⅝ / ⅝ TO ½	✓		✓	✓	✓	✓	✓		✓		✓
G FRAME (2 & 3 POLE)	5-100	250 AND 600	125, 250 AND 250	5,000 AND 10,000	15,000 AMPS. A-C	¾ TO 1	✓		✓	✓	✓	✓		✓		✓	✓
K FRAME (2 & 3 POLE)	70-225	250 AND 600	125, 250 AND 250	10,000	15,000 AMPS. A-C	1 TO 1½	✓		✓	✓	✓		✓	✓		✓	✓
L FRAME (2 & 3 POLE)	125-600	250 AND 600	125, 250 AND 250	10,000	25,000 AMPS. A-C	2 TO 2½	✓		✓	✓	✓		✓	✓		✓	✓

Table I—Check chart of Westinghouse small air circuit breakers.

For this reason it is necessary to apply the magnetic breaker on the trip rating, making sure the continuous rating is equal to or greater than the full load current of the motor load. For example, with a motor load of 90 amperes, it would be necessary to have the setting above the starting current of the motor to start it. If the starting current is eight times normal, or 720 amperes, then the magnetic breaker should be set at least nine times the rating of the breaker, or 810 amperes. There are two magnetic breakers, one with a range of 170 to 450 trip amperes and the other with a range of 420 to 1200 amperes, both rated 100 amperes. In the foregoing example, the one with a trip range of 420 to 1200 amperes would be used. With a motor load of 30 amperes and a starting current of 270 amperes, the 100-ampere magnetic breaker with a trip ampere range of 170 to 450 amperes would be used. In each case the trip amperes would be set just above the starting current in order to afford the maximum protection.

All of these breakers are completely enclosed in an asbestos base molded material. Each pole is insulated from the adjacent pole by a molded wall for high dielectric and surge test voltages.

TABLE II

Maximum Tripping Time on 200 Per Cent of Normal Rating Permitted by The Underwriters' Laboratories

Range in Ampere Rating	Maximum Time to Trip in Minutes
0- 35	2
36- 50	4
51-100	6
101-225	8
226-400	10
401-600	12

Table II—Maximum tripping time on 200 per cent of normal rating permitted by Underwriters' Laboratories.

The breakers are all trip-free. In other words, if the breaker is closed on a short circuit, it trips on overload or short circuit even though the handle is held in the "on" position. This prevents damage to the wire and eliminates danger of the breaker exploding and injuring the operator. The contacts are all made of a non-welding silver alloy that gives low watts loss on full load and high rupturing ability on short circuit conditions. Due to the inverse time thermal elements the breakers have a time delay on low overloads that permits starting motors, but above the motor starting current the magnetic trip operates the breaker instantaneously. This means the breaker interrupts the circuit at once, on short circuit, preventing overheating of wires and minimizing damage to control equipment. After the short circuit or disturbance has been removed, the power or current can be restored immediately by throwing the handle to the extreme "off" position and then to the "on."

TABLE III

Breaker Rating for Five Different Motor Sizes Per National Electric Code

H.P. of Motor	Full Load Current 440 V AC 3 Phase	Number of Motors of Each Size	Breaker Size for Group Protection
15	19	1	50
5	7.5	2	15
3	4.5	4	18
1	1.7	2	3.4
½	1.3	3	3.9
		Total	90.3 amperes

Table III—Breaker rating for five different motor sizes per National Electric Code.

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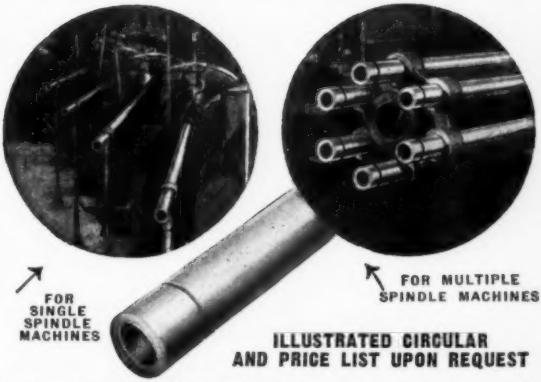

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The National Electrical Code allows grouping several motors on one feeder with one protective device as long as the current of the protective device does not exceed 100 amperes on 600 volts a-c and 200 amperes on 250 volts a-c and is used with approved starting equipment and other requirements as to wire size, length of feeder, etc. For example, grouping several motors on one feeder with one protective device might be done as follows: assume a machine tool using the following motors: one 15 hp; two 5 hp; four 3 hp; two 1 hp; and three ½ hp for use on 3-phase, 440 volts a-c. According to the Code, Section 4343 (b), the motors may be grouped as long as the motor control, controllers and overcurrent devices are approved for group protection. The size of the breaker for the feeder must be that of the breaker required for the largest motor—Section 4342, plus the sum of all the full load currents of the other motors. The total for the motors in the example cited is shown in Table III. This is based on Table 24 of the Code.

The breaker rating for a 15 hp, 3-phase, 440 V a-c motor, code letter "F" per nameplate, is 50 amperes according to Table 26 of the code. For an unlettered motor use Table 27. The kilovolt-amperes per horsepower with locked rotor for this motor are 5.59 per Section 94304 of the Code. To find out if this motor will start with the 50 ampere breaker, first calculate the locked rotor current

$$\left(\frac{5.59 \text{ kva./hp} \times 15 \text{ hp}}{440 \text{ V} \times 1.73}\right) = 116 \text{ amperes.}$$

The starting current is, therefore, 6.15 times as great as the normal running current

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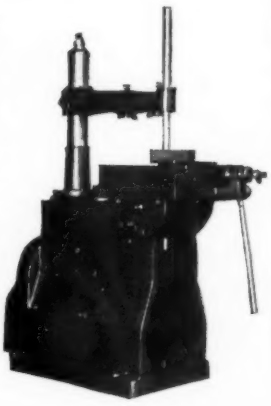

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The fuse rating is 60 amperes per column 7, Table 26 of the Code for a full load current of 19 amperes. Since breakers have a longer time lag than fuses, a 50-ampere breaker will hold while the motor is started. The breaker rating is 2.62 times normal current 50 amp. and it will be loaded to 232

$$\left(\frac{\text{19 amp. per cent of its rating during starting 116 amp. There is ample}}{\text{50 amp.}}\right)$$

time for starting, however, as the breaker has a time lag of 20 seconds or more at this loading. Since the 15 hp motor can be started on a 50-ampere breaker, a 90-ampere breaker should be selected for group protection as the total full load currents given in Table III is 30.3 amperes. As this value does not exceed the 100 amperes on 600 volts a-c limitation established by the Code, these eleven motors can be grouped.

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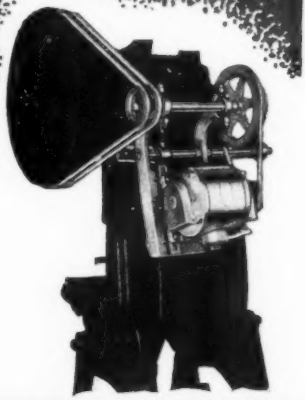

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ONE of the first things we learn in the works or office is that all men are really human beings. The second one is that the meanest one is only so because of certain physical or mental conditions that are the direct result of natural law. Usually it is not necessary to drag in heredity, for we find ample cause in his environment within our range of vision.

As a rule, a good understanding of men insures a wholesome regard for them, while failure to understand the other fellow (or the equivalent, the failure of the other fellow to understand us) may bring out many things that make us feel that he is not one whose feelings or interests should be considered.

To any one that has had experience in the shop and a fairly well-rounded business and financial experience in this particular field of work, the other fellow is invariably a good fellow whenever there is a chance for a fairly complete understanding.

If we can accept this statement tentatively, and follow it up by a determined purpose actually to feel it, then we have obtained something by royal process that otherwise would have required much time and perhaps some unpleasant experiences.

This knowledge is essential to success in designing machinery. True, many have been successful with a very different attitude, but engineers of the future must see to it that as many phases are as favorable as can be made so.

Regarding the absorption of the knowledge of working mechanism in the works, this is greatly facilitated by a wholesome relationship with the workers, and is greatly handicapped without it. Therefore, it is one of the cardinal points for the machine designer to get thoroly acquainted with other men in the work so as to know their likes and dislikes, as well as the mechanical needs.

Considering the Individual

Foremen and others who have direct charge of workers know that even the best-natured man should not be directed contrary to his habit method when he is under stress. In fact, it is not well to try any new thought on a physically tired man. This same worker, under conditions of rested mind and body, might be a so-called progressive.

Suppose we take two men exactly alike in all respects, with exactly the same knowledge of work to be done, and let them together undertake to dig a ditch, or repair or adjust an intricate machine, or perform any other kind of work. Let one of the men get in an awkward position to shovel earth or pull a wrench and become a trifle fatigued, either by the physical strain or the worry of the work, and let the other take a less strenuous part in the undertaking. We will then find that one has been changed into a progressive and the other into a conservative. The one who is tired from the strenuous part of the work cannot see why the other should suggest digging around a boulder instead of lifting it out of the ditch bodily, or why it may not be necessary to dismantle the whole machine in order to discover the fault. He cannot tolerate any suggestion of a new method

Production Counting Problems Solved!

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for exact production count on machines for post-war volume manufacture. They're accurate, rugged, streamlined . . . available in many types, sizes and speeds for a wide variety of applications.

Model 6-C-1 Ratchet Rotary counter shown above is rustproof, especially designed to withstand severe usage under adverse climatic conditions. Ideal for Stationary Engine, Cement Machine, Stoker and Compressor installations.

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DURANT MFG. COMPANY

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PRODUCTIMETERS
THE SPEEDOMETERS OF INDUSTRY

of working. It is actually easier for him to do the work by the more laborious but "habit" method.

Remember both of these men were the same in every respect, both energetic and neither one lazy (if, indeed, there is such a thing, but that is another story). Remember, too, that we can change them from day to day, putting first one and then the other in the physically strenuous position, and as often as we have changed their positions, we have changed their points of view and they become alternately progressive and conservative.

The brain of the man shoveling in the ditch does not work as well as his brother's standing on the bank. The worker does not want to be disturbed. You hurt him if you insist on his working his brain while his body is under stress. And this is one of the fundamental points for the director of work to take into consideration.

Fatigue Dulls the Brain

It is not necessary to assume that the worker has an inferior brain, and in fact we should not do so. It is only necessary to know that you must not try to extract a full measure of energy from the mind when you are already taking it from the body.

I am well aware that there is a possibility of developing both mind and body, and that some well-informed men think that the condition mentioned obtains only when there is an excess of stress of manual or mental labor. I have no intention to discuss the fine points of the question. I am only stating facts that have been observed thousands of times, when there has not been a severe burden of either kind of work.

This fact will show us that it is not natural for the worker to be interested in progressive schemes for betterment of methods of work or management of business. His most natural attitude is antagonistic to anything that is unwisely and thoughtlessly sprung on him, and this attitude is not necessarily due to his mental or physical make-up. It would be there just the same if all men were made exactly alike in all respects. It is the result of the work he is doing.

Bearing this state of affairs in mind,

it behooves the progressive man to approach the problem of applying his theories in a very careful manner. He must realize that the men in various parts of the work are under stress of every day's requirements that make it very difficult to take up intelligently any new scheme of procedure. Many an ideal doctrine is a beautiful thing in theory, but of little value if its introduction requires considerable but unavailable energy to put it into practice.

It is the doing of work that counts and the men who are doing things must not be annoyed. All plans for betterment must conform to the assimilating power of the men and must not cut off their food in time of change. In other words, the new plans should be so matched to the old methods that the change to the new will not interrupt production.

The wandering habits, whether of the dreamer, the tramp, or the Jack of all trades, are not of the efficient and constructive kind. Concentration of attention to a given subject brings its reward, if the subject is not too ponderous for the brain to weigh.

In a recent address Eric Johnston asked business to consider favorably "a decent minimum wage," the annual wage and a system of profit sharing. He did not, he said, propose such things as "cure-alls." He went on:

"I don't say they'll work in all cases. I don't propose these things as magic capsules. I do say they are things we businessmen must think about if we are to see a future for ourselves in terms of a future for others."

"This development of group association has been evolutionary as America grew. Group action is an economic fact which our new capitalism must recognize."

After looking at his son's report card the father said: "Bob, if you had a little more spunk you would get better grades, and, by the way, do you know what spunk is?"

"Sure, Dad, it's the past participle of spank."

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Rouse
HAND
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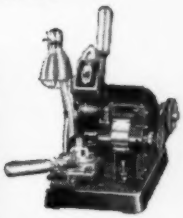

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It's easy to make light cuts—fast and accurately—on aluminum, brass, steel and other metals . . . This high-speed, motor-driven unit is ideal for second operations on plastics. *Anyone can quickly learn to run it.* Rouse Fixture Set-Ups increase productive capacity for a large variety of small parts for electrical work, instruments, aviation components, etc.

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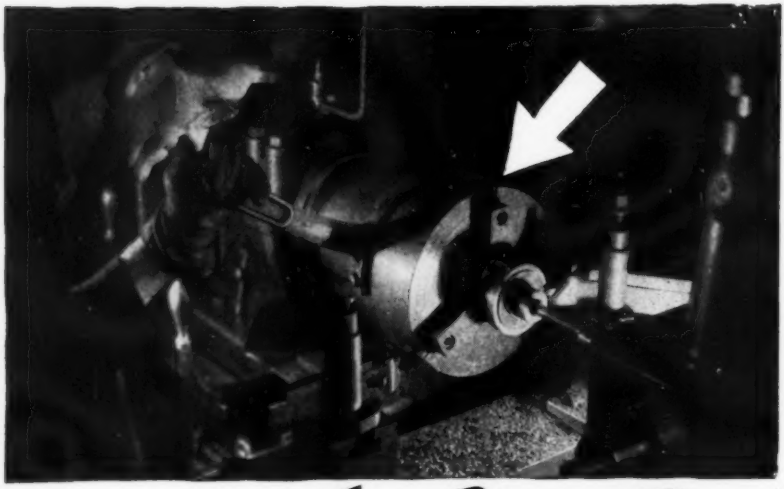


Barker Wrenchless Chuck — three-jaw type.

Barker Wrenchless Chuck—two-jaw type.

1/3 More Parts WITH A BARKER WRENCHLESS CHUCK

Pieces-per-hour went up and stayed up when this P & J Automatic Lathe was equipped with a Barker Wrenchless Chuck. Top output before the change was 18 pieces—the Barker Chuck stepped up production to 24 pieces—an increase of one-third. This user operates six Barker Chucks that are giving uniformly efficient service.

Continuous generous dividends in time saved and increased production are being earned by the hundreds of users of Barker Wrenchless Chucks. Are you interested in similar results?

Write today for full information.

THOMAS HOIST CO.

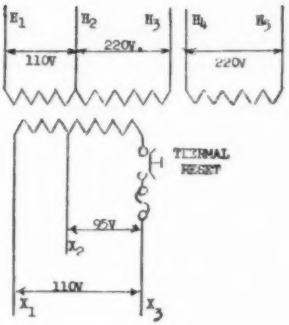
Chuck Division

20 South Hoyne Avenue, Chicago 12, Illinois

Standardized Control Transformers

By E. E. OPEL*

SIZES and ratings of control transformers now vary with each manufacturer to such an extent that in many applications, the installation of a built-in transformer requires special engineering. If uniform characteristics, sizes, and shapes of these transformers can be agreed upon, design can be simplified. One of the first problems in such standardization is of size.



PRIMARY	LINES ON	CONNECT	SECONDARY	LINES ON
550V.-60CY.	H_1-H_5	H_3 to H_4	110V.-60CY.	X_1-X_3
440V.-60CY.	H_2-H_5	H_3 to H_4	110V.-60CY.	X_1-X_3
220V.-60CY.	H_2-H_3	(H_2 to H_4) (H_3 to H_5)	110V.-60CY.	X_1-X_3
550V.-50CY.	H_1-H_5	H_3 to H_4	95V.-50CY.	X_2-X_3
440V.-50CY.	H_2-H_5	H_3 to H_4	95V.-50CY.	X_2-X_3
420V.-50CY.	H_2-H_5	H_3 to H_4	91V.-50CY.	X_2-X_3
400V.-50CY.	H_2-H_5	H_3 to H_4	100V.-50CY.	X_1-X_3
380V.-50CY.	H_2-H_5	H_3 to H_4	95V.-50CY.	X_1-X_3
220V.-50CY.	H_2-H_3	(H_2 to H_4) (H_3 to H_5)	95V.-50CY.	X_2-X_3

Figure 1—Winding diagram and voltage connections of special transformer manufactured by Brown and Sharpe Manufacturing Company, Providence, Rhode Island.

SIZE

Ideas of the proper size seem to run anywhere from something slightly smaller than a box of safety matches to a transformer designed with more than ample iron, copper, and insulation for most any emergency plus a small garage on the west end of it for a connection box. Obviously, the answer lies somewhere between these two extremes. A compromise must be made between the short, wide transformers necessary for shallow cabinets and those that are tall and thin for deep cabinets. Possibly these conflicting requirements can be reconciled by building a transformer that can be either end mounted or side mounted. Various transformer builders have standard punchings that establish the approximate size of their transformers. If new punchings are used, there will be considerable time and money involved to make the change.

• • •

*From a paper presented by E. E. Opel, Electrical Engineer, National Automatic Tool Company, Inc., Richmond, Indiana, at the Machine Tool Forum held at Westinghouse Electric Corp., Pittsburgh, April 9 and 10, 1946.

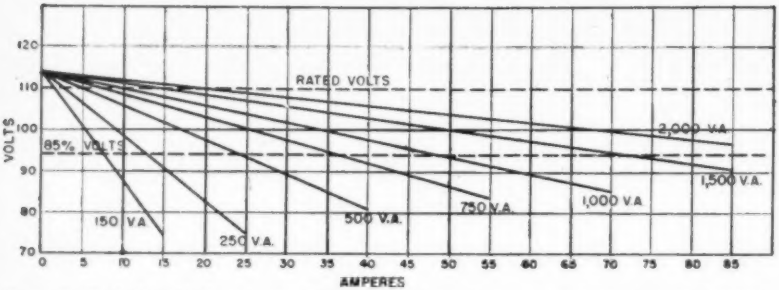


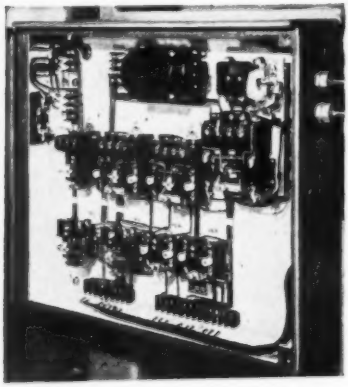
Figure 2—Typical regulation curves of various sizes of control transformers.

Length and width seem to be less important than depth. The following depth limits appear to be practical:

200 volt amperes—3.5 inches
1000 volt amperes—5.0 inches
2000 volt amperes—7.0 inches

Various transformers with the same ratio may be classified at several voltages such as 460—115 or 440—110. Why not establish 110 volts as the standard secondary voltage on all control transformers? All control coils are rated 110 volts and the N.M.T.B. standards are based on 110-volts control. Why even mention 115 volts?

Figure 3—A control cabinet made by Brown and Sharpe Manufacturing Company. Here the cabinet has been made deeper and the disconnect spaced out one inch for larger transformer.



Two lines of control transformers probably will be needed:

(1) A standard line rated at 440/220-110 volts. These would be the low price, high production, stock transformers. (Table I).

(2) A special rating line for odd power supplies (chiefly foreign). These would be lower production with a higher price than the standard line, but would also be a stock item.

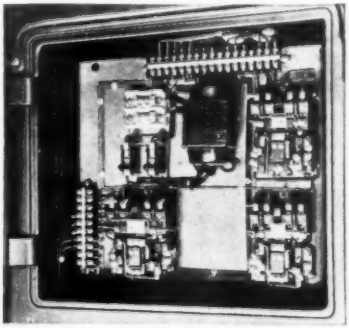


Figure 4—Depth is not so important in this cabinet made by the Cincinnati Milling Machine Company.

Special voltages require special transformers. An arrangement worked out by the Brown & Sharpe Manufacturing Company of Providence, Rhode Island covers many of these voltages in a single unit. Figure 1 shows the windings and the various voltages that can be obtained.

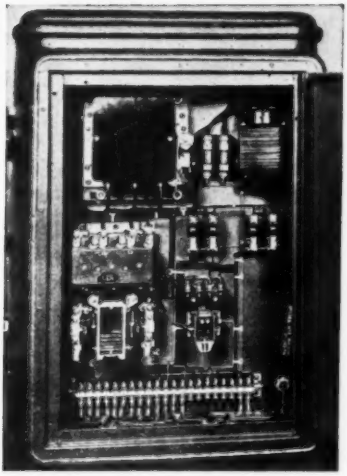


Figure 5—Like that shown in fig. 4, depth is not important in this cabinet manufactured by the Cincinnati Milling Machine Company.

Voltage regulation is one of the main considerations in the selection of control transformers. In order to select transformers intelligently it is necessary for machine tool engineers to have the kind of information represented by the curves of Figure 2. We have not been able to obtain these of late. It is quite possible that a 500 va transformer with good regulation will do a better job than a 750 va transformer with poor regulation. Figure 2 gives some hypothetical regulation curves. By assuming a load of 25 amperes and following the 25 ampere line vertically until the 85 per cent ordinate is reached, it is found that a 500 va transformer will be sufficient. Ampere loads can be determined from Table II in which data from various contactors and solenoids has been tabulated. It should be noticed that the inrush currents are from five to ten times the sealed amperes in all three types of load; contactor coils, solenoid coils, or lamps. Certain coils become energized after the remaining apparatus is operating. The total load then becomes the sum of the amperes in the sealed equipment plus the inrush current developed by the closing coils. The transformer size can be determined from this total.

ACCESSORIES AND MISCELLANEOUS

Either a fuse or a hand reset circuit breaker should be furnished on the low voltage side of the transformer. There is some preference for the circuit

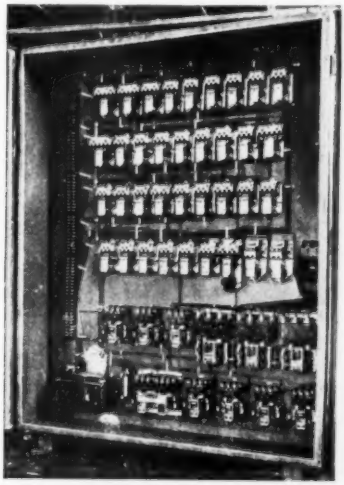
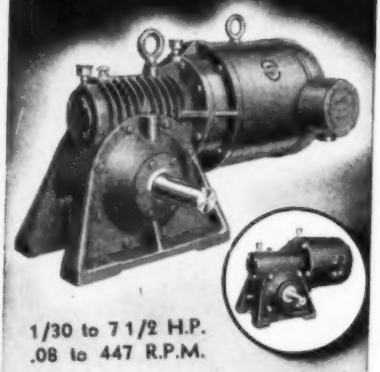


Figure 6—Size is not important in this cabinet made by the National Automatic Tool Company, Inc.

440/220 V Primary -		110 V Secondary -	60 Cy
NATIONAL MACHINE TOOL BUILDERS AND NATIONAL MANUFACTURERS' ASSOCIATION	G. E.	DONGAN	WEST
50 VA	75	50	50
100	150	100	100
200	250	150	150
300	350	250	250
500	500	500	500
750	750	750	750
1000	1000	1000	1000
1500	1500	1500	1500

Table I—Suggested standard control transformers.

Janette
SPEED REDUCERS



1/30 to 7 1/2 H.P.
.08 to 447 R.P.M.

For SLOW Speed DRIVES

JANETTE is one of the few Speed Reducer Manufacturers who build their own Gears, Gear Boxes and Motors especially designed for use with Speed Reducers.

During the 37 Years that Janette Geared Electrical Machinery has been manufactured, skimping has never been permitted in any of their products. This policy has resulted in establishing for Janette a world wide reputation as a manufacturer of the highest quality machinery.

Where DEPENDABILITY is a MUST, you can safely specify JANETTE Speed Reducers.

Janette Manufacturing Company
556 W. Monroe St. Chicago 6, Ill.

breaker since it provides protection against sustained overloads as well as against short circuits.

No enclosure is necessary to protect the transformer.

Both the standard and the special lines should have the same mounting dimensions with screws accessible from the front.

	110V - 60 CYCLES		
	INRUSH	SEALED	RATIO
COIL	AMP.	AMP.	I/IS
00	.9	.24	3.8
0	1.59	.27	5.8
1	1.73	.32	5.4
2	4.65	.80	5.6
3	7.27	1.45	5.0
207	.56	.22	4.4
209	4.6	.52	8.8
210	9.2	1.0	9.2
211	17.9	1.5	11.9
206	48.6	3.5	14.2
212	54.4	4.6	14.0
213	124.0	8.4	17.9

Table II—Contactor and solenoid data for determining ampere loads.

Terminals should be furnished, preferably of the clamp type. They should be separated so that the high-voltage leads are at one end and the low-voltage at the other.

The name plates should give complete information such as; volts, va capacity, cycles, catalogue number, wiring diagram, and maker's name.

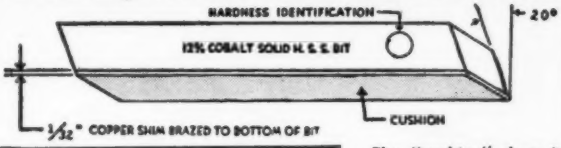
INTERFERENCE VIEWER

Uniformly accurate measurements of gage blocks, anvils, sealing surfaces, and other precision articles is claimed for the Optron Interference Viewer, of entirely new design, announced by Optron Laboratory, 2656-B Salem Avenue, Box 25, Dayton 6, Ohio.

The interference patterns are both illuminated and viewed on a line perpendicular to the plane of the pattern. Each pattern appears the same to different observers, simplifying inspection of one pattern by several observers.

The monochromatic light source in the Optron Viewer is completely concealed.

Now—for the first time—a real GENERAL PURPOSE tool using the HIGHEST COBALT HIGH SPEED Steel . . .



65-68 Rockwell C Hard

PRICE LIST
Cushioned Solid 12% Cobalt H.S.S. Tool Bits

Size of Bit			In lots of 1-9	10-49	50+
1/4	1/4	2 1/2	$ .65	$ .60	$ .54
5/16	5/16	2 1/2	.87	.81	.76
3/8	3/8	3	1.14	1.08	1.03
7/16	7/16	3 1/2	1.57	1.51	1.46
1/2	1/2	4	2.16	2.11	2.06
5/8	5/8	4 1/2	3.35	3.30	3.25
3/4	3/4	5	4.98	4.87	4.76
7/8	7/8	6	7.79	7.68	7.57
1	1	7	11.04	10.93	10.82

The "cushion" does it—you get the extreme Rockwell and RED HARNESS of 12% Cobalt H.S.S., plus an EFFECTIVE TOUGHNESS heretofore unobtainable with High Speed Steel Tools.
Gives production increases of from 20% to 200% through increases in speed and feed.
Ideal for shaper and planer work and interrupted cuts.

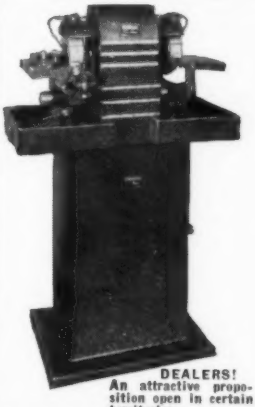
Write for complete circular

GUARANTEE: If not satisfied that this is the best GENERAL PURPOSE H.S.S. tool you have ever used—bits can be returned for full credit.

A TRIAL WILL CONVINCE YOU

GENERAL TOOL & DIE COMPANY Inc.

555 Prospect St. ***Phone: Orange 5-2500*** **East Orange, N. J.**



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Complete specifications and illustrations of this new Willey's Grinder Model 50-A.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway Detroit 1, Michigan

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COMPLETE SETS WITH MANDRELS AND STANDARDS IN CASES

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Being made of special steel which is triple plated with copper, nickel and chromium making them rust resistant.

Cat. No.	Size	Per Set
M-04	0 to 4 inch	$25.50
M-06	2 to 6 inch	33.50
M-09	6 to 9 inch	39.50
M-1	6 to 12 inch	64.50
M-2	12 to 18 inch	$79.50
M-3	18 to 24 inch	99.50

(Also available in sets up to 96 inches)
Complete catalog on request.

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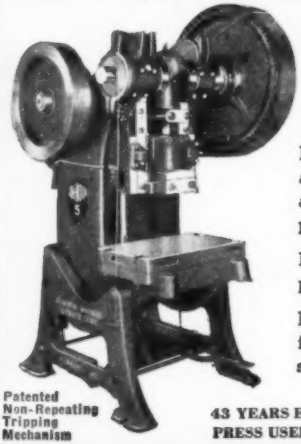
128 LAFAYETTE ST. NEW YORK 13, N. Y.



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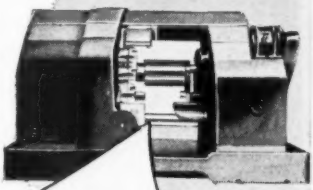
JOHNSON MACHINE AND PRESS CORP., ELKHART, INDIANA

SPECIAL LATHE BUYS!

KEY	TYPE	SIZE OR CAPACITY	QUANTITY AVAILABLE NOW
A	Heavy Duty Mfg. and Prod. Multi-tool, not automatic	Up to 30" swing	788
B	Single Spindle, Horizontal, Platen type		43
C	Single Spindle, Horizontal, Turret type		330
D	Multi Spindle, Horizontal	4 to 8 Spindles	9,518
E	Multi Spindle, Vertical	6 to 8 Spindles	302
F	Auto. between centers chucking, bars, single spindle	All sizes	2,036
G	Speed Lathes	1/6 to 5 HP	2,070
H	Turret Lathes	All sizes	160

D Multiple Spindle Horizontal Lathes

These 4, 5, 6 and 8 spindle machines or equivalent (see table) are located in Chicago, Cleveland, Detroit, Nashville and St. Louis offices of War Assets Administration. Ask any W. A. A. office.



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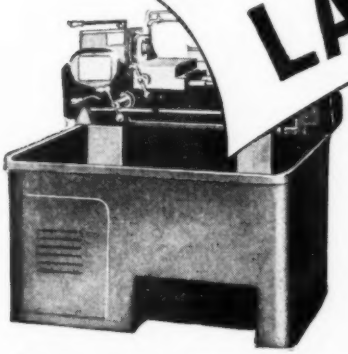
LATHES



An immediate source of additional or more modern production equipment is the large inventories held by the War Assets Administration. Built for war, basic machine tools such as these lathes are ready to serve in peace. Hundreds of items are available now, priced for quick sale. You can do yourself and America an important service by putting this idle production capacity to work as quickly as possible. Check this and the following three pages carefully and act at once to secure equipment you can use profitably.

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To War Assets Administration

Please send me information on the types of lathes checked at the right. I am also interested in the availability of the following types of lathes not listed in this advertisement:

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Name.....Telephone No.....

Firm.....

Address.....

City.....State.....

*For War Assets Administration address, see 4th page of this advertisement. 277-4

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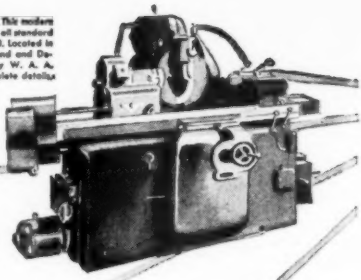
C___ D___

E___ F___

G___ H___

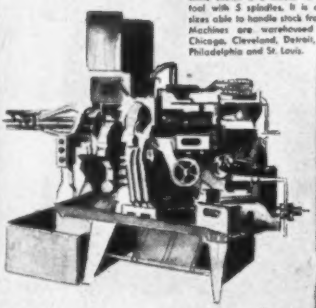
Bench Drill. Sensitive, single spindle, round column type, available as to 22" swing in capacity under ½"; from 16" to 24" swing in capacity from ½" to 1". Located in Boston, Birmingham, Cleveland, Charlotte, Detroit, Minneapolis, New York, Oklahoma City, Philadelphia, San Antonio and St. Louis Regional Offices.

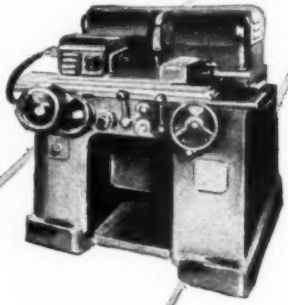
Universal Thread Grinder. This modern equipment is available in all standard sizes, 635 machines in all. Located in Boston, Chicago, Cleveland and Detroit. Simply contact any W. A. A. Regional Office for complete details.

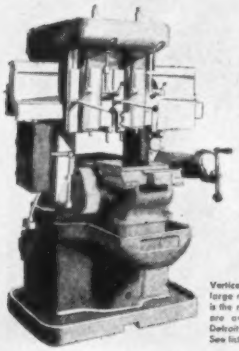


External Cylinder Grinder—Plain. This is a Norton model but other makes are also available. Total investments in Boston, Chicago, Cleveland, Detroit, Philadelphia and St. Louis amount to 1730 machines.

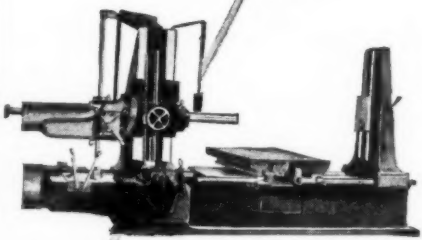
Automatic Screw Machine-Bar. The machine shown is a model "B" Davenport tool with 5 spindles. It is available in sizes able to handle stock from 1" on up. Machines are warehoused in Boston, Chicago, Cleveland, Detroit, New York, Philadelphia and St. Louis.







Vertical Profiler—2 spindle type. Typical of a large number of 1, 2, 3, and 4 spindle machines is the milling machine shown here. These machines are available in Boston, Chicago, Cleveland, Detroit, New York and other Regional Offices. See list (next page) for other types also in stock.



Horizontal Boring, Drilling and Milling Machines. Here is another illustration of a machine typical of an entire class of machine tools available in large quantity at many W. A. A. Regional Offices, in standard makes and sizes.

BASIC TOOLS

GOVERNMENT-OWNED SURPLUS PRODUCTION EQUIPMENT

(second in a series of 4-page advertisements designed to inform industry of available machine tool surpluses)

Here, by the hundreds, are the tools you need to modernize your production and establish new enterprises—available now at low cost—at a time when a war-devastated world is exerting the biggest demand for goods and services ever known. You owe it to yourself, your organization, and your fellow men to put this productive capacity to immediate use. So check this list carefully. Find out which of these basic tools will help you solve immediate production problems. Then clip and mail the expediting coupon to the nearest War Assets Administration office listed on the next page. War Assets Administration is a government agency specially created to help you apply War Surpluses to post war needs.

CHECK LIST OF SPECIAL MACHINE TOOL BUYS!

Here are a few of the many thousands of machine tools now available through War Assets Administration.

KEY*	MACHINE (Function)	TYPE	SIZE OR CAPACITY	Quantity Available Now
A—	Grinders	Bore Radius—External		116
B—		Bore Radius—Internal		72
C—		Contour Profile		73
D—	Screw Machine	Auto—Bar—Single Spindle	Up to 1¾" cap.	1975
E—	Screw Machine	Auto—Bar—Five Spindles	All sizes	1315
F—	Screw Machine	Auto—Bar—Eight Spindles	1¾" and Over cap.	380
G—	Engravers	Pantograph—2 Dimensions		70
H—	Honers	Internal—Horizontal	Under 6" Bore	175
I—		Internal—Vertical		129
J—	Lapping	Flat Surface Only	24" Diam. top plate	107
K—	Polishers & Buffers	Floor Type	½ to 10 H.P.	1479
L—	Lathes	Speed Type	Up to 2 H.P.	1490
M—	Saws	Circular Cut-off		280
N—	Abrasive Machine	Belt Drum & Disc		280
O—	Abrasive Cut-off			112
P—	Tapping	Vertical—1 & 2 Spindle		437
Q—	Tapping	Horizontal—1 Spindle		289
R—	Die Threading	Belt Rotary—1 Spindle		280
S—	Centering	Double End—Horizontal		113
T—	Painting, Chamfering & Boring			141
ZZ—	Gear Shapers	External & Internal Spur—External only	Up to 40" Diam.	280
PP—		Spur & Helical—External & Int'l		
QQ—		Spur & Helical—External only		
RR—		Bevel Type not Incl. Pinion Types in		
SS—	Gear Cutters	Generating Type Grinding		
TT—	Gear Tooth Finisher	Formed Wheel Type		
UU—		External only		
VV—	Gear Tooth Lapper	Comb. External & Internal		
WW—	Gear Tooth Shaver	Rotary Type		
XX—	Grinder	External Cylindrical—Plain		

KEY*	MACHINE (Function)	TYPE	SIZE OR CAPACITY	Quantity Available Now
U—	Shaver	(Not Gear)		104
V—	Roamer	(Not Ellis)		816
W—	Drawing Machine		100,000# and over	31
X—	Machinery & Equipment Allied to Primary Metal Forming Machine and Equipment			
Y—	Straight Side Presses	Fielding	All sizes	149
Z—		Vertical—Single Action	5 to 100 Tons	165
AA—	Flame Cutting Machine	Vertical—Double Action	5 to 100 Tons	111
BB—	Hardness Tester	Brinell—Portable & Power		1631
CC—		Rockwell—Manual & Power		200
DD—	Inspection Machine	Magnetic (Magnaflux)		425
EE—	Balancing Machine	Static		601
FF—		Dynamic		93
GG—	Boring, Drilling & Milling			67
HH—	Boring & Turning Mills	Horizontal	Under 5" to 6"	209
II—	Boring Fixed Bed Type Mill	Vertical	Under 36" to 120" Swing	683
JJ—	Precision Boring Machines	Vertical		87
KK—		Horizontal Bridge—single end	Under 8" to 14"	486
LL—	Drills	Horizontal Bridge—double end	Under 8" to 14"	236
MM—		Box column—single spindle	Under ½" Cap. Up to 22" Swing	587
NN—			½" to 1" Cap. 16" to 36" Swing	
OO—		Sound column—single spindle	Under 1" Cap. Under 36" Swing	
PP—				
QQ—				
RR—				
SS—				
TT—	Gear Holder	Spur, Kingsbury Way & Vertical Horizontal	Up to 22" Swing	161
			4" to 16" Cap.	296
				280
				221

*KEY letters are provided for your convenience in filling out the coupon to the right. They do not refer to any other listing of surplus property. If used in contacting War Assets Administration Regional Offices by letter, wire or phone, please refer to this advertisement.

EXPEDITING COUPON

Use this coupon to conserve your time. Circle by key letters the machines in the above group in which you are interested and mail to your nearest W. A. A. Regional Office.* We will determine in advance our stock situation on the machines and inform you quickly, without obligation.

To War Assets Administration:*
Do you have in surplus stocks the following machine tools? Where are they located? What is their condition?

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, BB, CC, DD, EE, FF, GG, HH, II, JJ, KK, LL, MM, NN, OO, PP, QQ, RR, SS, TT, UU, VV, WW, XX, YY, ZZ

I am also interested in the following machine tools not included in your list:.....

.....

.....

.....Tel. No.....

Name.....

Firm.....

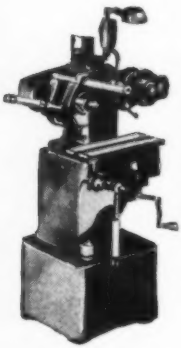
Address.....State.....

City.....

*For War Assets Administration address, see 4th page of this advertisement.

All items shown on this and preceding three pages are offered subject to prior sale. This surplus property has previously been advertised and offered to prior claimants including Veterans of World War II.

MILLERS



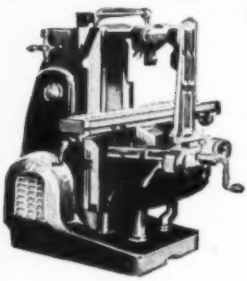
A Horizontal Hand-Feed Millers

For this and all the machine tools shown in this advertisement, simply contact your nearest War Assets Administration Office listed below, using the coupon provided. That office will know that large inventories of this miller, for example, are available in Boston, Detroit, Kansas City, and New York and how to get one or more for you.

GOVERNMENT-OWNED SURPLUS PRODUCTION EQUIPMENT

These milling machines, and the other surplus machine tools shown on the preceding 3 pages, were productive enough and modern enough to win history's biggest war. They were versatile enough to turn out some of the most intricate weapons of all times. As they stand—some used and some unused—they are the largest untapped source of peacetime productivity and profits in the U. S. today. With them you can modernize and speed up your production or establish new enterprises at lowest cost. And it's easy to do. As a first step in acquiring these machines, simply fill in and mail the coupons on this or the preceding 3 pages.

B Horizontal Miller (knee type) These machines are located in quantity as follows: #1, under 28" Table Travel, New York, Boston, Detroit. #2, 28" to 34" Table Travel; Detroit, Cleveland, Boston. #3, 34" to 42" Table Travel; Detroit, Cleveland, Chicago and Philadelphia. #4, 42" to 50" Table Travel; Detroit, Cleveland. #5, over 50" Table Travel; Detroit, Cleveland, Chicago.



FREE INFORMATION

To War Assets Administration:

Without obligation, please send me detailed information on the milling machines checked at the right and on the following types not included in your list:

.....

.....

.....

377-4

MILLER CHECK LIST

(These key letters correspond to the machines listed in the table above. Simply check those in which you are interested.)

A	E	I
B	F	J
C	G	K
D	H	L

Name.....

Tel. No.....

Firm.....

Address.....

City.....

State.....

SPECIAL MILLING MACHINE BUYS!

KEY	TYPE	SIZE OR CAPACITY	QUANTITY AVAILABLE NOW
A	Horizontal, Plain, Hand Feed	All sizes	384
B	Horizontal, Plain, Knee Type	#1 to #5	2,135
C	Vertical, Universal	#1 to #3	847
D	Auto Millers	All sizes	455
E	Bed Type, Plain, Horiz. Spindle	All sizes	2,703
F	Vertical Spindle, standard	All sizes	428
G	Vertical Fixed Bed Profiler	1 and 2 Spindles	847
H	Thread Millers—Universal (non-auto)	12" Work Dia. and up.	70
I	Thread Millers—Universal (auto)	Up to 30"	239
J	Thread Millers—Chasing (auto)		207
K	Planetary Milling Machines	6" Work Dia. and up	206
L	Spline Millers		260

WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta · Birmingham · Boston · Charlotte · Chicago · Cleveland · Dallas · Denver · Detroit Helena · Houston · Jacksonville · Kansas City, Mo. · Little Rock · Los Angeles · Louisville · Minneapolis Nashville · New Orleans · New York · Oklahoma City · Omaha · Philadelphia · Portland, Ore. · Richmond St. Louis · Salt Lake City · San Antonio · San Francisco · Seattle · Spokane · Cincinnati · Fort Worth (Tel. 3-5381)

SHORT-CUT TO IRREGULAR SHAPES

THE HEINRICH HEAVY-DUTY

HANDNIB

A Hand Operated Combination Nibbling, Shearing, Punching and Rod Cutting Machine. (With swivel base)

Capacity: Nibbling and Shearing 3/16" flat stock . . . Punching Holes up to ½" in ⅛" sheets . . . Rod Cutting 3/16", ¼", 5/16" and ⅜" round bars. *Ask for Descriptive Folder.*

NATIONAL MACHINE TOOL CO. HEINRICH

THE NATIONAL MACHINE TOOL CO.

1536 CLARK STREET • RACINE, WISCONSIN

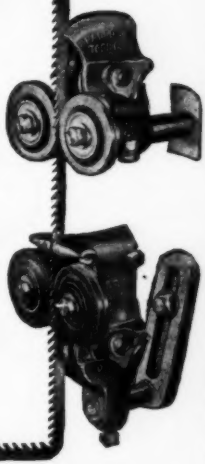
MORE SPEED MORE SUPPORT

MORE WORK

SPEED UP PRODUCTION on Old or New Band Saw Equipment!

PADDOCK BALL-BEARING GUIDES

hold the working portion of the blade as if it were in a frame, free from friction. Inter-changeable wheels running with the blade give strong, smooth, fast support. You save blades — you can cut more materials — PADDOCK GUIDES give perfect operation under all conditions. Sold on ten day FREE TRIAL. Write for circular and price.



PADDOCK TOOL COMPANY

Guide Makers Since 1920

1418 Walnut Street Kansas City 6, Mo.

Paddock

BALL-BEARING

BAND SAW GUIDES

WHAT'S NEW IN METALWORKING

GOVERNMENT CONTRACTS

A fourth edition of a Manual of Procedure provides otherwise unobtainable information of value to firms interested in, or now supplying, goods or services to the Federal government.

The author has a background of 21 years of legal service with the Federal government including several years as Coursel to the Comptroller General of the United States. In the latter capacity he handled hundreds of cases involving disputes between the government and its contractors and suppliers. Consequently, he has first-hand knowledge of his subject and his statements may be regarded as authoritative.

Last revised in 1939, the present edition brings the subject matter down to date, and is further improved by the inclusion of references to many of the more important statutes and court decisions, applicable to contracts with the Government.

Copies may be obtained, without cost or obligation, by writing the Fidelity & Deposit Co. of Maryland, Baltimore, Md., or its subsidiary, the American Bonding Co. of Baltimore.

CABL-OX CLAMP

A new wire clamp called Cabl-Ox has been developed by the Nunn Mfg. Co., 2125 Dewey Ave., Evanston, Ill. This new product is the first step in reconversion to peacetime production by the Nunn Organization which made a spectacular record in Wartime production of shells and other essential metal products.

The clamp is said to incorporate a new and exclusive wedging action. This feature makes it possible to hold loads in excess of the tensile strength of the rope used. The unit is of alloy steel, cadmium plated. It is easily assembled by unskilled labor and may be readily disassembled for tightening of stretched lines. It is made in all standard sizes from 1/16" to ¾".

FLOOR MAINTENANCE MACHINE

An illustrated two-color bulletin is available, that describes the electric, self-propelled model "J" Tennant Floor Machine with 12-inch drum-type accessories. Applications include removing incrusted grime, dry cleaning, sweeping, polishing, burnishing and sanding industrial floors. Copies can be had by writing G. H. Tennant Company, 2530 Second Street North, Minneapolis 11, Minnesota.

SURFACE PLATE

A new surface plate has been announced by The DoAll Co., (Gage Division), Minneapolis, Minn. According to DoAll, this plate conforms to or exceeds in all respects the Proposed Commercial Standards for Laboratory Class Cast Iron Surface Plates as submitted to industry by the National Bureau of Standards November 8, 1945.

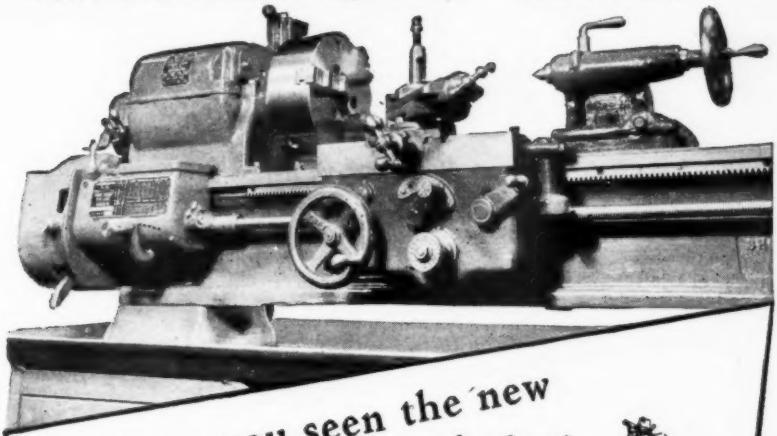
The DoAll Surface Plate, with a working area 14"x24", is made of a specially alloyed close grain iron and is so constructed that the system of ribbing gives ample support to the working surface.

The working surface is pin-point hand scraped with 22 or more evenly distributed bearing spots per square inch. The maximum deviation of the bearing areas from a mean plane is .0002" over the entire surface.

The underside of the ¾" overhang is machined all around. Thus work or fixtures can be clamped to the surface plate. The edge of the working surface has also been drilled and tapped on 2" centers all around to enable the user not only to make up gages and comparators from The DoAll Company's Producto-Chek set, but to mount special fixtures of his own design.

The DoAll Surface Plate comes with removable handles and plywood cover. The inside of the cover is lined with a heavy oil-saturated felt so that the plate is well protected from rusting when not in use.

SHELDON Precision Lathes



Have you seen the new SHELDON Lathes...

From any angle a better lathe.

...those built in the new SHELDON machine tool plant? Always good lathes, these new SHELDONS are even better, not only in design refinements but in extreme accuracy, greater work capacity for size, "sweeter" handling and actual beauty of finish. Only a set-up like the new SHELDON plant could build such lathes—a specially designed building, the most modern manufacturing methods, complete tooling with row on row of the finest, most modern manufacturing equipment.

Make it a point to stop in at your SHELDON dealer's and see these new machine tools. Note their moderate prices. They are a revelation of what modern equipment and methods produce.

Write for Catalog

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Arbor Presses • Vises
Sheldon-Vernon Horizontal Milling Machines • Vertical Milling Machines and Jig Borers • Shapers

4242 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

ROTO-FINISH 60″ MACHINE

The Roto-Finish Mechanical process of finishing and de-burring parts may now be performed with still greater efficiency with the new 60″ Wet Process Machine just announced by the Sturgis Products Co., Sturgis, Mich., sole patentee owner of Roto-Finish.

The new 60″ Machine may be had with one to five compartments, permitting processing that many different sizes of parts simultaneously. A cam lock enables operator to remove the door easily and quickly and to load and unload with minimum time to shorten the cycle operation. This door lock has a spring feature which permits any gases to escape that might build up in the cylinder. Lining of the octagonal cylinder is easily removable, permitting speedy re-lining of cylinder with fitted hard wood.

The machine is used in the Roto-Finish wet process employing predetermined combinations of chips and compounds to finish and de-burr at the same time.

The action occurring in this process is a precision grinding operation that leaves parts with a bright, high color finish highly suitable for plating. Moreover, all parts are uniform as to their surface and all rough edges and sharp corners are removed.

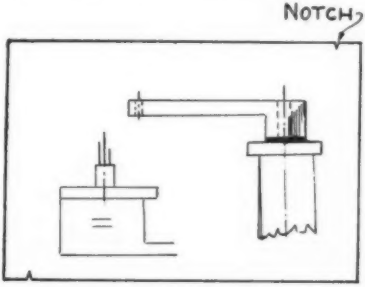
The 60″ Machine is suited particularly to production finishing of parts, increasing the savings in time and labor gained by the mechanical Roto-Finish method. The Roto-Finish Wet Process used in the 60″ Machine cuts the time cycle from 25% to 50%, depending on the type of part processed; and permits the finishing department to match the over-all productive rate of the plant. With parts having a brighter, more uniform finish, plating costs are in turn reduced.

Another important saving gained is the elimination of hand labor, since one operator alone handles several Roto-Finish Machines.

NOTCHES ALIGN DRAWINGS

By Ronald Eyrich

When a partially completed tracing must be removed from the drawing board to be completed later, re-alignment of the tracing with the original drawing is often difficult. However, if two diagonally opposite



notches are cut into the edges of both drawing and tracing before the tacks are removed, they can be replaced on the board repeatedly and brought into register by aligning the notches, just as dowels align machine parts.

Take a Tip from an old Machinist

"WALTON TAP EXTRACTORS

Get out Broken Taps the fastest and easiest of all known methods. Inexpensive, too!"

Satisfaction Guaranteed
Write for folder No. 12 and 30-Day Free Trial Offer.

THE WALTON COMPANY
94 Allyn Street • Hartford 3, Conn.

CLOSED
TRADE AUTOM MARK
CLOSED

OPEN
Plain Type

CONTINUOUS HINGES

Offset Type
OPEN

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

AUTO MOULDING & MFG. CO.
2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/8
Lengths to 120"

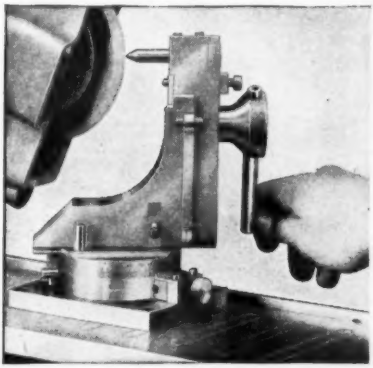
THREE-FOURTHS OFFSET.
SEMI-OFFSET

USE

Fluid–Motion for Modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION

J & S Radii & Angle Dressers in the "Fluid-Motion" series are among the finest precision dressing instruments procurable . . . regardless of cost. There is a standard model to fit most form-dressing requirements.



Features

Fluid-motion dressing
.0001" accuracy
Automatic centering
7" & 14" wheel capacities
Large range yet compact
Chatterless and dustproof

Write for catalog

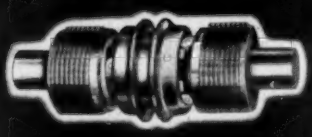
J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 2, N. J.

Specify For

COMPACT DESIGN
HIGH TORQUE *
HIGH-RATIO LEVERS
POSITIVE NEUTRAL
PRECISION BUILT
LONG WEAR LIFE
EASY ADJUSTMENT

ROCKFORD
PULLMORE



MULTIPLE-DISC
CLUTCHES

Send for This Handy Bulletin

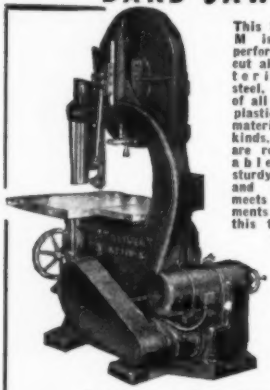
It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin

*PULLMORE discs provide high capacity and efficient lever design enables light engaging pressure. Discs are accurately made from special clutch-disc materials and are tested for flatness. Made in single and double types, for operation in oil or dry, PULLMORE clutches have capacities from 1 to 90 H. P. at 500 R. P. M. They handle loads of much greater capacitity, when operated at higher speeds.

ROCKFORD CLUTCH DIVISION BORG-WARNER

1309 Eighteenth Avenue, Rockford, Illinois, U. S. A.

OLIVER METAL CUTTING BAND SAW



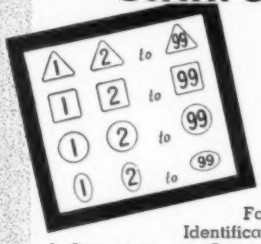
This 36" No. 116-M is a versatile performer. It will cut almost any material including steel, sheet metals of all kinds, sprues, plastics, laminated materials of all kinds, etc. Speeds are readily adjustable. Machine is sturdy, dependable and safe and it meets all requirements for saws of this type.

The No. 116-M belongs to a broad line of Oliver band saws and industrial equipment.

Let us send bulletins.

OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN, U. S. A.

New STEEL INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

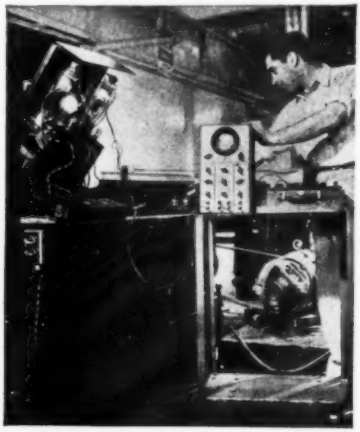
NEW METHOD STEEL STAMPS, Inc.
141 JOS. CAMPAU DETROIT 7, U. S. A.

WAX DIPPING TANK

The D. C. Cooper Co., 1467 S. Michigan Ave., Chicago, Ill., announces the development of a new electrically heated wax dipping tank, designed for all wax dipping operations. Of 14 gauge steel, it is heavily insulated for economy in operation and comfort of operator. Strip heaters on the bottom between the inner and outer tank shells are not exposed to the wax.

A 1" valve in the bottom permits easy draining and there is an overflow drain near the top. Thermostat control assures proper and accurate temperature, preventing overheating or discoloration of the wax.

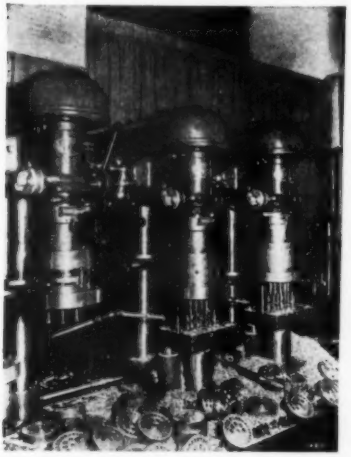
Sizes range from 5 gallons to 300 gallon capacity to meet all requirements.



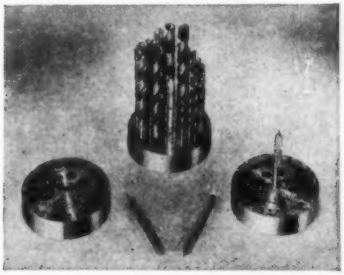
TESTING ELECTRONIC CONTROL SYSTEM—The cathode ray oscilloscope shows the wave form of the motor load current during the load testing of a Westinghouse Mototrol at the East Pittsburgh, Pa. plant. The Mototrol is an electronic control system that takes full advantage of convenient a-c power, yet provides all the speed control advantages inherent in a d-c motor as well as automatic regulation features since it converts a-c to d-c for armature and field supply. The Mototrol cabinet is on the bench to the left; the operator's right hand is on the push button speed control station; and the motor is in the background, being framed by this portable test bench.

ZAGAR DRILL STAND AND SCRIBER

Zagar drillheads are provided with collet type of drill chucks, hardened, ground and lapped leader pin bushings for drill



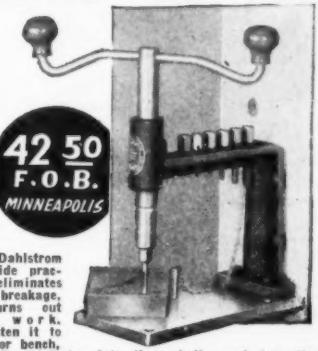
jig alignment. They are said to make possible, extremely close center distances on relatively large size drills. All bearings are either roller, ball or needle type antifriction. Heads are 80% aluminum while other essential parts are hardened and ground steel.



In the illustration, two toolmaker's scribers appear, with conventional phonograph needles for points. These are made by using a Zagar 1" speed chuck on small Logan and Atlas turret lathes to perform the turning operation. For the hexing operation a standard Zagar 1" index fixture is used on a conventional hand mill. For slotting, two 1" air fixtures are used on an automatic Kent-Owens mill. For the straight knurl operation, a Zagar vertical broaching machine with special knurling broach is used. Write Zagar Tool, Inc. 23880 Lakeland Blvd., Cleveland 17, Ohio.

A new pocket-size stove that can burn 100-octane gasoline has been developed for Army use. To prevent clogging and to withstand corrosive fuel, a Monel wire cloth filter is used—110 mesh, .003 wire, with 60,000 openings.

Square, Straight Tapping in HALF THE TIME



The Dahlstrom Tap Guide practically eliminates tap breakage, and turns out uniform work. Just fasten it to a post or bench, slip a Tap Adaptor into the spindle, and turn the handle. Equipped with 7 Adaptors from 8-32 to ½" (taps not furnished). Literature on request. Dahlstrom Mfg. Co., 416 South Sixth St., Minneapolis 15, Minn.

Dahlstrom TAP GUIDE

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

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NIELSEN TOOL & DIE COMPANY
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MELCO CENTER POINT LUBRICANTS

MELCO CENTER POINT LUBRICANTS are manufactured in both oil and grease form and are engineered products high in E. P. properties and designed specifically for use on:

Lathe and milling machine centers.
Grinding machine centers.
Steady rests and heavy journals.
Tapping, Broaching and Extruding.
Any application where extreme pressure or frictional heat prevails.

MELCO CENTER POINT LUBRICANTS are more economical than conventional lubricants and will prove a definite aid to production because:

Only one application is necessary.
No time is lost in being obliged to re-lubricate.
They prevent galling and burning of centers.
Their high lubricity reduces power consumption.
Lathe centers may be drawn up snug against the work, allowing finer tolerances and eliminating chatter marks.
Work expansion will not affect their "film".
They will permit higher speeds and heavier cuts.
They do not emulsify with cutting oils or liquids.
They are non-toxic.

MELCO CENTER POINT OIL, because of its ability to reduce frictional heat, and its high load-bearing, wear-resisting properties, is an excellent additive for cutting, broaching, tapping, or drawing oils. It may also be added to ordinary gear oils to improve their lubricating qualities.

Send for Free Samples

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PRICES ON MELCO CENTER POINT OIL & GREASE

One Dozen 1"x6" Tubes	$2.15 per Doz.
Three Doz. 1"x6" Tubes	2.00 per Doz.
1 quart can	1.25
1 gallon can, per gallon	4.00
5 gallon can, per gallon	3.75
15 gallon drum, per gallon	3.50

All Prices are F.O.B. Chicago, Ill.

METAL LUBRICANTS CO.
Lubrication Engineers
3211 S. Wood St., Chicago 8, Ill.
Phone Lafayette 9188
C. B. TEETER, National Distributor

LARC-O-MATIC WRENCHES

One of two separate styles of the new Larc-o-matic automatic, adjustable, ratchet-action wrench, a product of the Oscar W. Hedstrom Corp., Chicago, manufacturers of mechanical and engineering implements, is depicted above. This model has a V-groove in the jaws for gripping corners and faces of nuts alternately for close-quarter work. Another style of the Larc-o-matic has pipe wrench teeth for use on rounded nuts.

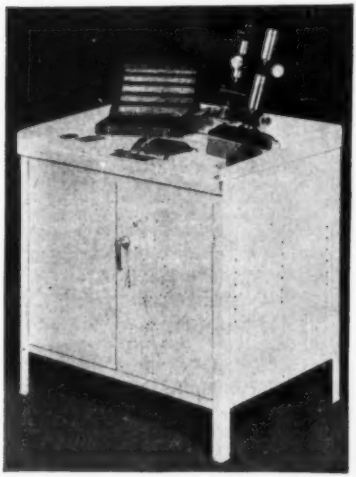
HUNTER ELECTRO-COPYIST

Two new bulletins issued by Hunter-Electro-copyist, Inc., Syracuse, N. Y., describe equipment for copying photographs, printed material and drawings and for making negatives and prints. One folder features use of the machine to reproduce working prints for plant reconversion, thus saving drafting room time.

Machine prints from pencil and template layouts, intensifies faded tracings and prints on linen, vellum or paper. Models made in sizes up to 48" x 168" for industry. Unit operates from an ordinary lighting circuit and requires no darkroom.

NEW CENTERLESS LAPPING MACHINE

A new centerless lapping machine employs a unique principle of lapping for the precision finishing of cylindrical



pieces. A precision finish of less than 2 micro inches is said to be obtained on this equipment and lapping time is greatly reduced. One piece or a hundred can be lapped without the necessity for making setups, or using ring laps or other tools.

Bulletin 446 on the Model 100 Centerless Lapping Machine, including price list of reversible gage blanks, will be mailed upon request by Size Control Co., Division of American Machine & Gage Co., 4636 W. Fulton St., Chicago 44, Illinois.

MILLING MACHINE BULLETIN

The Cincinnati Milling Machine Co., of Cincinnati 6, Ohio's publication No. M 1372 covering their line of plain and duplex hydromatic milling machines has just been released. It is illustrated with photographs of the machines, a line diagram of the control set-up, and charts of automatic table feed cycles. It includes general specifications for each of the twelve models currently in production, as well as dimensional drawings and a list of standard equipment.

WASHERS on Tap as You Need Them

When You Make Them The HOVIS Way

Simply invest in HOVIS UNIVERSAL MASTER WASHER DIES. Then 5 small easily removable parts are all you need to change to make a new size washer.

Eliminate the cost of complete new dies. Make washers on short notice. *Write for literature.*

HOVIS SCREWLOCK COMPANY

8096 E. Nine-Mile Rd. Van Dyke, Mich.
Suburb of Detroit

PLEASE LET US HELP YOU IN TOOLING UP

WE DESIGN AND MAKE TOOLS, DIES, FIXTURES, SPECIAL MACHINERY
ESTIMATES SUBMITTED PROMPTLY FROM YOUR BLUE PRINTS

DELIVERY WHEN PROMISED { 50 TO 90 TON CAPACITY OF SMALL STAMPINGS

ALL NEW EQUIPMENT — 1000 HOURS PER WEEK . . .
YOUR VISITS ARE WELCOMED. PH. JEFFERSON 1956
1686 E. HUDSON ST.
PHILP DIE TOOL AND MACHINE CO. COLUMBUS 3, OHIO

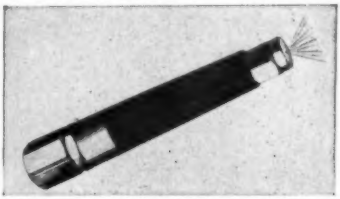
GROUND THREAD FLAT ROLLING DIES

The Jones & Lamson Machine Company, Springfield, Vermont announce the introduction of Ground Thread Flat Rolling Dies to the products of their manufacture. These dies are for use on Waterbury

Farrell, Manville, National Bolt Maker, and National Electric Jr., and Sr. Thread Rolling Machines. The present maximum length of these ground thread dies is equivalent to No. 40 Waterbury Farrell or 10", they can be supplied in any width up to 8". A standard type of starting and leaving end has been established for the short die, this and the thread form are ground into the die in one operation on thread grinders built especially for this kind of work. All dies are matched, and the elimination of shims, speeds up set up time. Because of the accuracy of the dies, even distribution of rolling pressure is assured, and die life is increased on both soft and heat treated materials. Single face, Duplex and step type dies are available in all thread forms.

PROTECTIVE-LIQUID SPRAY

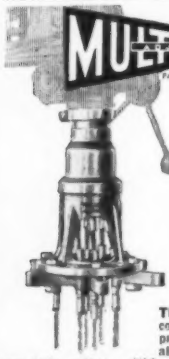
Now available is a new unit known as Finespray designed for use where a fine



spray or water mist is desired. A typical use is in foundries for coating castings with a film of protective liquid. This light weight unit can be hung from the ceiling or mounted in other advantageous positions, permitting easy one-hand operation. The Finespray will handle only water or other free-flowing liquids, and will operate on low pressures. For details about the Finespray write: Lonn Manufacturing Co., Inc., East New York St., Indianapolis, Indiana.

New Employer: "Are you familiar with mules?"

Negro Stableman: "No, sir. Ah knows 'em too well to get familiar."



DRILL 6 HOLES AT ONE STROKE—ADJUSTABLE FOR ANY PATTERN!

Your drill presses equipped with adjustable MULTI-DRILL heads will

- Reduce costs thru multiplying your present drill press production
- Conserve valuable floor space in your shop or departments
- Reduce your equipment investment
- Often save their cost on the first job

The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—¾" minimum centers. Standard capacity 3/32" to 11/32" drills. Modifications available for special applications.

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ADJUSTABLE TO ANY DESIGN

PYRO THE SIMPLIFIED OPTICAL PYROMETER

Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.

Save hands with Strand's

SWEEP SAFGUARDS

With the Strand Sweep double cam action, you obtain proper sweep movement that prevents accidents.

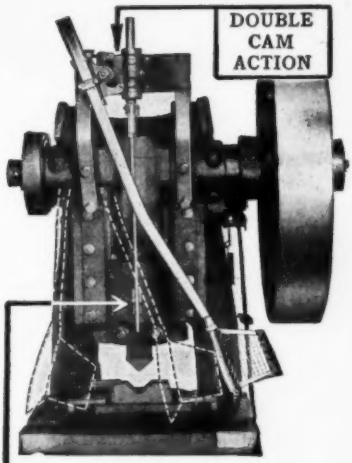
Operation of Safguard from press head provides additional safety in case of screw or other breakage.

Send for Circulars on Strand Sweep and Enclosure Safguards

STRAND MFG. CO.

Safety Engineers

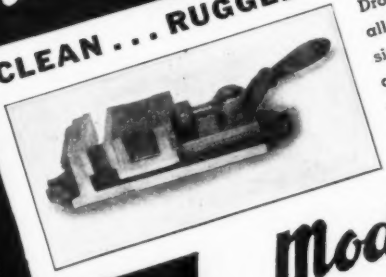
607 W. Lake St. Chicago 6, Ill.



SAFGUARD operates from head of press

a Cam Vise that is . . .

CLEAN . . . RUGGED . . . QUICK IN ACTION



Drop forged cam parts; hardened alloy steel screw and handle. Precision built for rapid production work on milling machines. Hardened and ground jaws. Semi-steel castings throughout. Square key slots in base at right angles.

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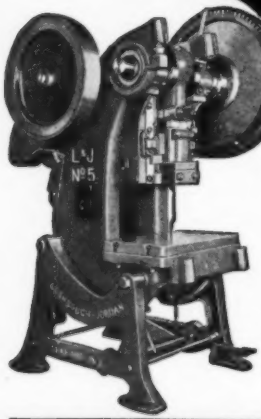
Standard Since 1911

L&J



INCLINABLE POWER PRESSES

5 to 79 tons

NO. 5 BACK GEARED TYPE

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L & J PRESS CORP.

Successors to Lashbrouch-Jordan Tool & Machine Co.

1625 STERLING AVE. ELKHART, INDIANA

THOUSANDS . .

YES, thousands of scarce cutting tools and supplies for the manufacturer who is looking for the finest quality at low cost . . . are illustrated in our new catalogue.

A postal card will bring you this informative catalogue — without charge. If it's facts and figures you want—WRITE or PHONE;

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are TOPS in Production

and are available in Noiseless Spinning and Vibrating Hammer types. Also Vertical and Horizontal Multiple Spindle Spinning Machines.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

C E Station, Bridgeport 5, Conn.

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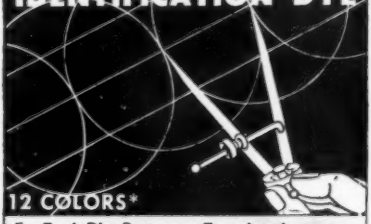
LAY-OUT AND IDENTIFICATION DYE



12 COLORS*

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of stock and parts . . . Shows up in sharp relief—dries instantly—easily removed . . . Write for circular.

*Purple shipped unless otherwise specified

MICHIGAN CHROME & CHEMICAL COMPANY

6340 E. Jefferson Ave. • Detroit 7, Mich.

LUBRALOY MECHANICAL PACKING

Lubraloy Process Mechanical Packing, recently taken over by Flexrock is self-lubricating. They explain that this is effected by a novel alloy structure of anti-friction metals, which by a special process is impregnated with heat-resisting, lasting lubricants which cannot be driven off by heat or pressure and are emitted constantly.

The packing also is said to be self-forming and molds itself easily to the size and shape of stuffing box, sealing yet allowing rods or pistons to operate with a minimum of friction.

Installation of new equipment at the Flexrock plant is practically completed and this new packing will soon be available in suitable forms for every packing use—spools, dieformed rings and sets, and coils. Further details are available from Flexrock Co., 3634 Filbert St., Philadelphia, 4, Pa.

GLOBE EXPANDS LINE

According to an announcement by W. B. Merriam, Executive Vice-President, Globe Products Mfg. Co., has purchased the Machine Tool Division of the Clayton Mfg. Co., of Alhambra, Cal.

The principal product affected is the Clayton Boring Bar Holder and accessories. This is a patented holder which has sold into the hundreds of thousands, and its outstanding features are known to tool engineers and production men thruout the nation.

The acquisition by Globe of the Clayton Machine Tool Division is in line with Globe's policy of manufacturing and selling a complete line of machine tools, essential to manufacturing plants of all sizes. With the addition of the Boring Bar Holder and accessories, the complete Globe line now consists of Hand Screw Machines, Bed Turrets, Cross Slides, Vises, Globe Millers, End Mill Holders, Dividing Heads, Arbors, Step Blocks, Milling Dogs and Work Holding Fixtures.

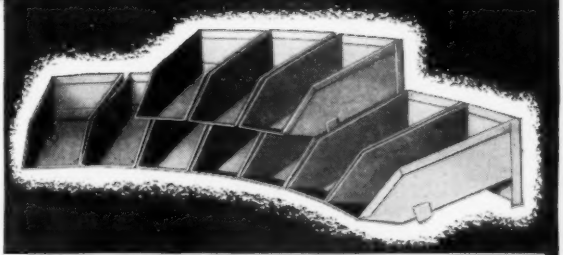
According to Mr. Merriam, Globe Products is desirous of increasing the number of its distribution outlets in order to handle the increased business on its regular line and on the new Boring Bar Holder and accessories.

STAINLESS STEEL HANDBOOK

Allegheny Ludlum Steel Corp., Brackenridge, Pa., offers a new Stainless Steel handbook, 100 pages, 5 x 7½" It contains data on 26 stainless types, a 44-column finder table, corrosion resistance to 230 materials, discussions of properties, products, available forms and sizes, and fabrication methods.

NEW BINS

for assembling small parts



Floors slope to feed parts to front – end reaching and fumbling.

Bins taper toward front to form convenient semi-circle – keep all bins within easy reach.

Nesting, locking construction for rigid set-up, can be easily changed when necessary.

Welded construction. Rolled, smooth edges.

Hoppers available to increase capacity and cut time taken for refilling.

Two sizes – tapered or straight edges.

Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa

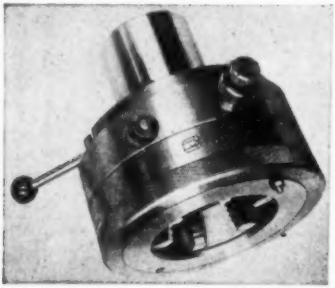
Write Stackbin Corporation, 1085 Main St., Pawtucket, R. I., for details and prices.

STACKBIN SYSTEM

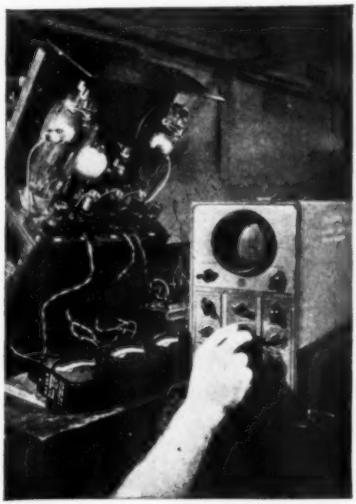
"Stacked and Still Accessible"

NEW DIE HEAD

The Jones & Lamson Machine Company, Springfield, Vermont announces the introduction of a new "High Speed" Series (Radial Chaser Type) Automatic



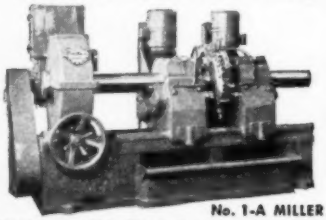
Self-Opening Die Head. This Die has a threading capacity range from 2½" to 4" for heavy duty threading and up to 4¼" for 8 pitch threads and finer. It is hardened and ground on all the working surfaces. The Chasers ae ground in the thread form after hardening and are guaranteed to hold lead correct within .001" per inch. The accuracy of the form, as well as the correctness of the lead, will produce threads to specifications of Class 3 fit, American National Standards. The built-in, eccentric float combined with longitudinal float makes it a very satisfactory threading tool for heavy saddle type Turret Lathes.



A cathode ray oscilloscope shows the wave form of the motor load current of a Westinghouse Mototrol unit on final test at the East Pittsburgh, Pa., plant. This electronic motor control system takes full advantage of convenient a-c power, yet provides all the speed control advantages inherent in a d-c motor, and automatic regulation features, since it converts a-c to d-c for armature and field supply.

Roto-Matic
MACHINE TOOLS

• A combination of precision workmanship and advanced design contribute to the quality of output and quantity of work pieces produced on Roto-Matics. Production far exceeds that of standardized equipment used in the metal working industries today, because practically all operations are continuous eliminating down time for loading.



No. 1-A MILLER

Catalogue B-90 illustrating and describing various types of drilling, milling, reaming and boring machines is available on request.

DAVIS & THOMPSON CO.
MFRS. OF MACHINE TOOLS & MICROMETERS
MILWAUKEE, WISCONSIN

WALTON TAP EXTRACTOR

REMOVES BROKEN TAPS!

Prices of popular sizes from $1.50-$2.20
Write for folder
No. 12 and 30 DAY FREE TRIAL OFFER

Gets them out fast. No damage to threads. Salvages valuable work. Simple and easy to use.

THE WALTON COMPANY
94 Allyn Street • Hartford 3, Conn.

THE "FORM-MASTER"

ANGLE & RADIUS DRESSER

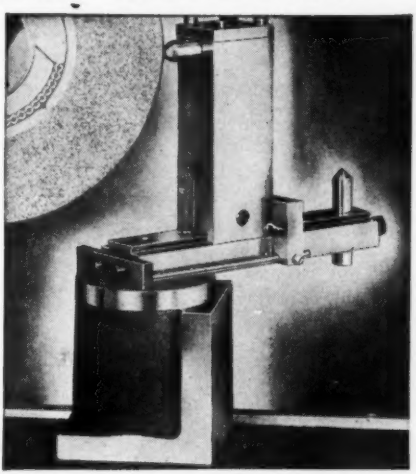
A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included — $150.00 complete.

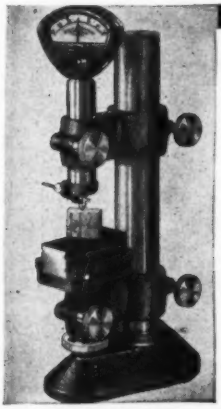
Features

Large range.
Chatterless and dustproof.
.0001" accuracy obtainable.
Simple to operate.
Reasonably priced.

Call your supplier or write

J. & S. TOOL CO.
477 Main St., E. Orange 2, N.J.





Made in 4 SIZES

MIKROKATOR "MIKRO" (MINUTE)
FRICTIONLESS AMPLIFICATION

RAPID
RELIABLE
SENSITIVE
LIGHT
COMPACT
STURDY

Complete elimination of friction, lag, and backlash insures positive, dependable repeat readings. Pointer responds instantly to the slightest movement of measuring tip; no swinging past true reading, no waiting for pointer to come to rest. No lights or electro magnets, no warm-up period required. No electrical connections, can be readily moved to different locations. GRADUATED: .0001" to .00001"; .001 mm to .0002 mm.

Write for CIRCULAR — BB

SWEDISH GAGE CO., OF AMERICA
8900 ALPINE AVE., DETROIT 4, MICH.

NON-SLIPPING SPINDLE

By Ronald Eyrich

An ideal spindle for shop desks can be made by attaching a pointed rod to a regular suction cup such as are used to

hold coat hooks to auto windows. Vibration will not cause this spindle to "creep" even tho the shop desk is tilted.

CAPT. CLARK RETURNS

Vanadium-Alloys Steel Company of Latrobe, Pennsylvania announces the appointment of James A. Clark to their operations staff. For the past four years, Mr. Clark has served as Captain in the Ordnance Department of the United States Army, and as Asst. Production Superintendent and production metallurgist.

NEW HYDRAULIC CYLINDER LINE

A new line of Non-Rotating Hydraulic Cylinders is now offered by Anker-Holth Mfg. Co., Port Huron, Mich., in addition to its present line of Air Cylinders.

Absence of tie rods (keeper ring design); cushioned cylinders at no increase in overall length; two-way action; one piece, step-seal piston rings; all standard mountings in each pressure range; for oil or water service; safety factor 6 to 1 are some of the features claimed. The cylinders are designed for low pressures up to 750 psi and high pressures from 750 psi to 2000 psi and are available in sizes ranging from 1½" to 8" bore. A complete catalog of the Anker-Holth Hydraulic Cylinders is now in preparation. This will give details in design and dimensions and will present photographs, sectional drawings, pressure charts, etc.

SCHAUER Speed Lathes

Ideal for polishing, de-burring, lapping small metal and plastic parts.

Ask for Cat. 440

SCHAUER MACHINE CO., 2064 Reading Rd., Cin'ti, O.

CUTTING TOOL CATALOG

Distribution to industry of a new 1946 Eclipse Counterbore Co., catalog is currently announced by R. G. Michell, Pres. The new literature is available to industry as a complete presentation of Eclipse production and cutting tools.

The company specializes in cemented tungsten carbide tipped cutters, special holders and drives, balanced drive inverted spot facers, Welch plug cutters and core drills.

A copy of the catalog may be had by addressing the Sales Dept., Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20, Mich.

New Nesting Type Tote Pans

20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.
BRIDGEPORT, CONN.

For Fast, Accurate Metal-Cutting Use

KENNAMETAL CEMENTED CARBIDE
TOOLS, BLANKS, and MILLING CUTTERS

KENNAMETAL Inc.
LATROBE, PA.

BATCH TYPE OVEN

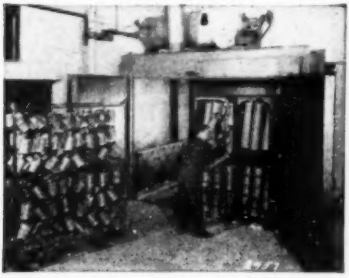
Use of high-volume forced convection heat to bake corrosion-resistant plastic coatings on aluminum chimney liners is the function of a recently installed Despatch batch type finish baking oven at the Heremetal Company plant in Minneapolis, Minnesota.

To solve such corrosion problems a specialized plastic (Heresite) has been found effective for coating the flue liners because, when properly applied and baked, it is smooth and highly resistant to chemicals, moisture, heat, acids, salts, solvents and to chipping or cracking.

A forced convection oven was needed capable of providing high volume heat flow throughout the chamber and with automatic temperature control.

These heat and control characteristics were needed to assure complete polymerization of four (4) successive coats of plastic into an enamel-like finish that would adhere to metal. High volume heat flow was also necessary to achieve rapid, uniform baking, inside and out, of 450 liners per load when placed on racks in the oven.

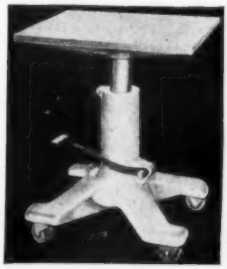
To meet these specialized processing requirements, a Despatch gas fired rack loaded finish baking oven was installed.



Heremetal uses aluminum liners instead of steel because the former is only ⅛ as heavy and the plastic will not chip from it. Liners are fabricated from flat aluminum stock and processed.

Pickling is the first step in protecting the metal liners from corrosion. They are cleaned in a hot caustic bath and etched with a hot muriatic and a hot nitric acid bath. After each bath the liners are rinsed with water. Etching the aluminum stock and processed.

After the final rinse the liners are given two primer coats and two finish coats of plastic. The first three coats are baked for 20 minutes each at 300 degrees F., the last coat for 1½ hours at 400 degrees F. Baking of the last finish coat polymerizes all four coats into one and changes the color from yellow to a deep brownish purple with a high gloss finish.



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Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

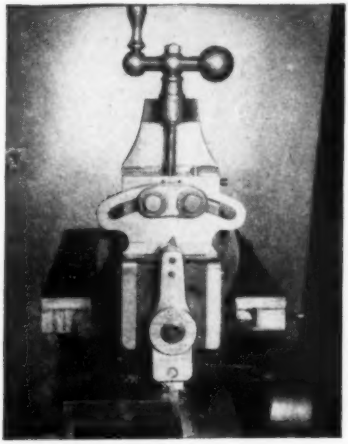
SHAPER BIT HOLDER

The All-In-One Tool Co., of Chicago has announced a Shaper Bit Holder which they claim will eliminate five conventional tool holders as well as the tool post.

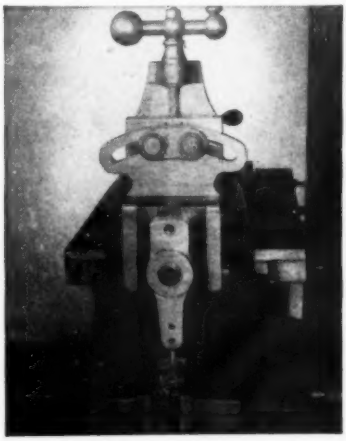
Stock may be removed faster by using two of these tool bits, one alongside the other, and extending the second tool bit to cut as much as the first. In shaping tool steel blocks for dies, by extending the first tool bit to cut heavier cut, and the second tool bit just enough to shave the surface smooth, the need for surface grinding is lessened.

The bit holder holds cutting off blades by supporting them the entire length of the holder. The Luers patented cutting blade is used exclusively in this device.

Since it is possible to finish the dove-



tails on both parts to be machined without resetting the form tool all angles will be equal and a minimum of time will be needed to scrape the parts together. The



form tool is convex on one end and square on the other and may thus be used in place of two milling cutters.

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FROM STOCK
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No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads . . . their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time . . . Money . . . Labor!

We also make silent gears of rawhide and Fabriol.

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FOR OMCEMS CUTTING THEIR OWN GEARS, WE CAN MAKE IMMEDIATE DELIVERY ON BLANKS SAWED TO SPECIFIED DIAMETER AND FACE

Greaves MACHINE TOOL CO.
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HAVING TROUBLE WITH SMALL RADIUS WORK?

CRAFTSMEN, SHOPMEN, tool, die and pattern makers! You need THE STUART ABRAZOR, the indispensable power tool for small radius work on metal, plastics, wood, glass! Perfect shaping, machining, finishing, polishing, deburring, snagging, roughing,—plus perfect tool-sharpening!

FITS ANY STANDARD DRILL PRESS (2¾" column) own table tilts to 45 degrees; swings out of way when not in use. Delivers 700-4500 surface feet of abrasive per minute ranging from 7000-36,000 RPM at ½" spindle. Small cost, immense labor and time saving.

Write for free illustrated, detailed folder.

STUART INDUSTRIES, Inc. 307 Lafayette St. New York 12, New York

BOAT BUILDERS TAKE NOTICE!!

PROPELLER REAMERS

This special Reamer reams the tapered hole in marine propellers. It has the following outstanding features:

1—Tapers ¾" per foot.
2—Left hand, spiral, odd number of flutes. This gives a smooth shearing cut, does not damage keyways and eliminates chattering.
3—Flutes are notched. This breaks up chips and releases drag on cutting edge.
4—Morse taper shank for use in drill press or lathe.

No.	Dia. Small End	Dia. Large End	Shank Size Taper	Overall Length	Price Net
0	½"	1"	No. 2	12"	$10.50
1	¾"	1½"	No. 3	16½"	19.35
2	1¼"	2"	No. 4	18"	26.98
3	1½"	2½"	No. 4	22"	47.25

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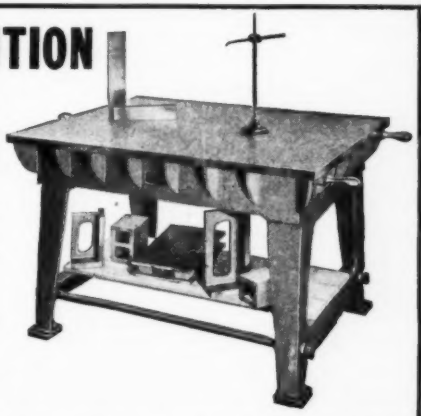
TRAVERS TOOL COMPANY

5 COURT SQUARE **LONG ISLAND CITY 1, N. Y.**

A USEFUL ADDITION



Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907

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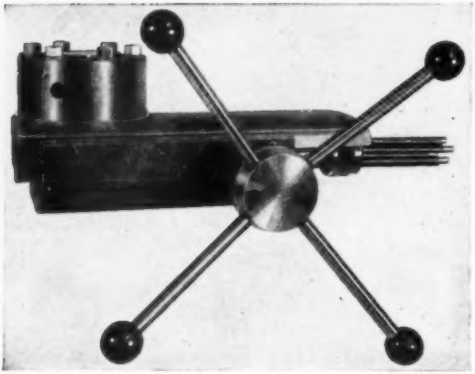


It offers these features:—6 tool and stop positions, automatic indexing, 4½" working travel, 5⅜" overall travel, 5" diameter all-steel head, gear and rack travel, hardened index bushings. Tapered id of index bushings is ground in place on exact radius with special grinder to assure accurate indexing. A husky ram stop takes the jolt when turret is indexed, thus taking load off indexing pins and reducing wear to a minimum. This tool has heavy 60° dovetailed ways and adjustable gib on ram to compensate for wear. An eccentric locking feature clamps attachment to lathe bed instantly.

UNIQUE NO. 50 BED TURRET

The Unique Mfg. Co., 4807 North 31st Ave., Omaha, Neb., is now producing its new Unique No. 50 Bed Turret for 9" South Bend workshop lathes. The Unique No. 50 Bed Turret is a versatile tool, constructed from heavy gray iron castings.

G-B-M STEP CHUCKS

For all lathes, grinders, etc. with collet attachments. Sizes for work up to 4" diam. Steps bored in head close with automatic concentricity. Chuck fast like collets. Prompt delivery.

Send for Circular MB

The GILBERT-BAKER-MIDLAM Co.
DAYTON 2, OHIO

CHROME-CARBIDE PLUG GAGES

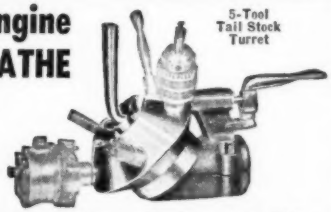
A new size range of Griffin Chrome-Carbide Thread Plug Gages is announced by George O. Griffin Co., Whittier, Cal. These gages, which are noted for longer life because of their wear-resistant surfaces, have been available heretofore down to ¼" O.D. Perfection of an improved process now permits application of chrome-carbide alloy on blanks of much smaller size, producing finished thread plug gages in machine screw sizes down to and including No. 4 (.112" O.D.)

Besides increased life, another important advantage is claimed. Since Griffin gage construction employs a hard, extremely wear-resistant surface of chrome-carbide alloy welded over a soft steel core, the brittleness encountered in tool steel or sintered carbide gages is overcome. The ductile core and shank permit extreme deflection without rupturing, thus eliminating breakage losses and hazards to the work.

***PRESTO!* Your Bench or Engine Lathe BECOMES A TURRET LATHE**

Several sizes for converting up to 24" swing. For forming, roughing, boring, drilling, tapping, finishing, etc. without stopping lathe or changing tools.

Send for catalog of Dividing Heads, Belt Sanders, Swing Grinders, Turret Attachments, etc.



JEFFERSON MACHINE TOOL CO., 700 W. Fourth St., Cincinnati 3, Ohio

ELECTRO-AIR CONTROL

A low voltage (24V) Electro-Air control which permits conversion of standard machine tools and fixtures to automatic or semi-automatic production units by pneumatic control of machine or fixing movement has recently been announced by the Electro-Air Devices Co. of 2811 W. Fletcher St., Chicago, Illinois.

The manufacturer states that the control may be used with any standard air cylinder and can be furnished to provide either single or multiple cycle control to perform a wide variety of operations such as automatic drilling, tapping, milling, indexing, holding, etc., etc. Advantages claimed for the control are: more compact design, absence of close-fitting ports or valves, low voltage employed reduces accident hazard and assures longer life of electrical units; easy and quick installation anywhere on any machine or fixture; accurate, control of any push or pull motion provided by high speed action of solenoid-operated needle valves.

The basic Electro-Air control units consists of a step-down transformer (115-220 VAC to 24V), Enbloc (manifold type) solenoid valves, pressure regulator, needle valves and armature, stainless steel.

IMMEDIATE ACCEPTANCE

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LAPPING COMPOUND

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NOW YOU MAY SOLVE ALL YOUR LAPPING PROBLEMS WITH

THESE TWO TWINS

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Every tube is ready to use as delivered. Each tube contains the most efficient density of STAR DUST diamond particles for each grit size. "Opthalmic" tube with extremely fine nozzle delivers minimum compound required. No Waste. No contamination. Easy to apply. Easy to clean up. Surface finish of less than half a micro inch is easy. Indispensible for Carbide Tools.

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The POWDER dry —in vials— for mixing with your own carrier

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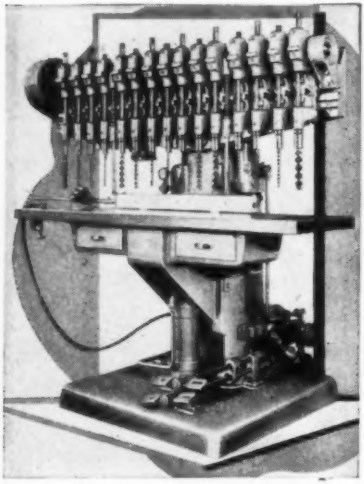
1 SPRUCE STREET • NEW YORK 7, N.Y.

The COMPOUND —in tubes— ready-mixed for convenience

ROOT MODEL "CDH" DRILLING & BORING MACHINE

BULLETIN No. 131 recently issued by B. M. Root Co., York, Pa., describes in detail the Style "CDH" Hydraulic Feed Multiple Driller and Borer. The illustration is taken from the bulletin, which accounts for the shadow background.



The machine has application where holes are drilled in multiples in wood, plastics, light metals and composition materials. A wide field of application is possible because of the patented hydraulic table feed system which has a range of operating characteristics suitable for drilling materials of high or low density.

Operating advantages include drilling accurate duplicate parts on a quantity production basis. Parts drilled are interchangeable and will match. Often it is possible to accelerate production by attaching simple jigs to the boring tables so that sheets of plywood, plastic or metal may be "stacked", and drilled in multiples with one feed stroke.

A wide selection of spindles permits drilling of various patterns of regularly or irregularly spaced holes of different sizes on close or extended centers. Types of spindles available include single spindles, cluster drill heads for intricate close center work, and single and double expansion spindles.

Spindles are spiral gear driven from a common drive shaft with the gears totally enclosed and operating in a bath of grease. Spindles are adjustable laterally along spindle mounting frame.

Boring table is made of laminated wood, or metal. The metal table can be equipped with a coolant system, if desired.

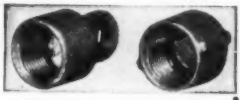
Hydraulic system for actuating table can be set for full automatic, or intermittent operation. Feed rate is stepless and can be adjusted precisely to the drilling operation at hand. Thus the machine can be "timed" to the normal working cycle of the operator so he can give his undivided attention to handling stock on and off machine.

For drilling materials that require or approach metal cutting feeds, a rapid traverse feed valve is furnished.

Drilling table is under complete and instant control of operator at all times as he can start, stop or reverse table motion at any point of feed or return stroke by means of conveniently located foot levers.

The machines are built in 3', 4', 5', and 6' length capacities.

The PRUTTON *Tapmaster* • • •



3 TAPPING MACHINES IN 1

Speedy; can do three jobs at once, tapping any size hole up to 7/8". Three separate motors. Single or continuous cycle. Positive feed by husky lead screw prevents tearing of threads. Safe—no jamming of work. Ample tanks for coolant oil—ready accessibility. Descriptive bulletin. 3/4" awning eye-end and 3/4" pipe cap; 1500 per hour on Tapmaster.

D. H. Prutton Machine & Tool Co.

5295 West 130th St., Cleveland 11, Ohio

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S. NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D—10" Table; Model E.L.—12" Table. Model No. 14—14" table and heavy pedestals for all our machines.

BEWARE OF IMITATIONS

Our machine carries the Butterfly trade mark.

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Accuracy .80005"

NEW Black Granite ANGLE PLATES

(Patent Pending)

Have all the improved features of

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3. Warp and Shock Proof
4. Rust proof
5. Harder than tool steel
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7. Sheds abrasives
8. Super smooth action

Write for bulletin giving full information.

Dealers and manufacturers agents — *a few good territories are still open.*

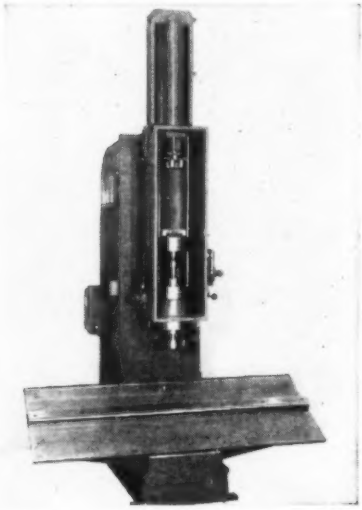
RAHN GRANITE SURFACE PLATE CO.

1149 PLATT CIRCLE • DAYTON 7, OHIO

"FLAT-TOP" BROACHING UNITS

A line of "post-war" broaching machines has been announced by Colonial Broach Co., Detroit 13, Mich. Designated as Colonial "Flat-top" Utility pull-down broaching machines, the best short description of them probably is that they are vertical "horizontal" machines.

Since the early days of broaching, the horizontal type machine has been considered the all-purpose or "Universal" type. Such machines usually had fairly large vertical platens at one end for mounting the work while the broach was pulled thru. It was necessary usually, of course, to provide some means of sup-



porting the work in some manner during broaching—particularly if the work piece was large.

The new "Flat-top" machines obviate this. By making the platen horizontal, large bulky parts can be slid onto the table and manually positioned without any other support. Thus setting up for the broaching of one or several holes in the same bulky part, broaching of keyways in such parts, etc., becomes a simple matter.

The machine according to Colonial is not intended for high production broaching. altho automatic broach pullers are available. Primary purpose of the machine is to fill the need for a "Utility" machine for large work which will eliminate the necessity of special work holding fixtures. In the "Flat-top", the broach is pulled thru the work by an hydraulic pull-mechanism operating on the same principle as in Colonial Universal Horizontal machines. To install the machine, it is necessary to provide a hole in the floor furnishing clearance for the hydraulic cylinder projecting 36" below base of machine.

To broach, the part is merely placed on the flat-top table and manually positioned. Broach is inserted in the hole to engage broach puller. The machine is started. The broach is pulled down thru the work. The machine stops. The part is moved aside. The machine then returns the broach to loading position, permitting its removal.

All operating mechanisms are concealed within base. Provision is made for chip disposal thru an opening in one side of base.

The machine illustrated (in cut-away to show broach puller and top of pulling mechanism) is of 4-ton capacity with 30" stroke.

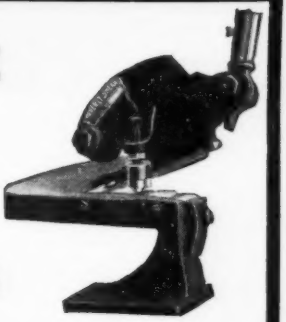
It requires a floor area of only 42 by 65". The table measures all of 24 by 60" and its flat surface is just 48" above floor. Thus no operators' platforms are necessary. The machine was originally developed to handle specific jobs in Colonial's own plant but its performance and the ease of broaching large work indicated the desirability of making the machine available to other manufacturers to take care of their miscellaneous broaching jobs.

STAR LIVE CENTERS

The Star Live Center is sturdy and compact with no overhang, having the same general dimensions as standard dead centers.

The spindle is made of high grade alloy tool steel hardened to 64 Rockwell then precision ground. The shank is hardened and ground both internal and external for accurate fit. It has ground thrust type ball bearings and ground radial roller bearings. The bearings turn in an anti-scoring concentrated lubricant, compounded to withstand pressures greater than 50,000 lbs psi. The Neoprene seal protects against damage from abrasive materials and retains the lubricant for the life of the center. The life expectancy of the STAR Live Center is given as 3,000 hours fully loaded, based on actual tests made under regular production conditions.

CUT ANY SHAPE BETTER with BEVERLY Throatless SHEARS

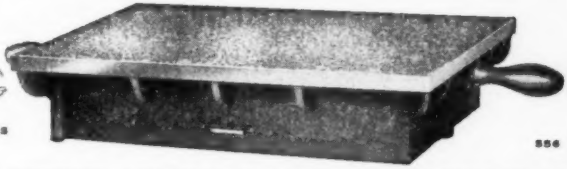


The No. B-3 BEVERLY Bench Type Shear with Ball Bearing Hold Down handles 3/16" or No. 10 gauge stainless steel. This sturdy shear weighs 58 lbs. and is equipped with H. C. H. C. Blades for heavy duty service.

Let us send Bulletins giving full details on the BEVERLY LINE —

THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

Machinists' Endorse . . . CHALLENGE SURFACE PLATES



12 Sizes—3½x4 inches to 24x36 inches

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Precision-built of special analysis semi-steel castings, specially heat-treated to prevent distortion. Surface either hand-scraped or precision ground. Heavy diagonal ribbing the full depth of plate prevents sagging or yielding under load. Wood cover with all plates. All-steel electrically welded stands, portable or stationary are available. Write now for latest Challenge catalog.

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GRAND HAVEN, MICHIGAN, U.S.A.

H.S. Drills, Milling Cutters, Lathe Tools, H.S. and C.S. Taps and Dies, Drill Chucks, Lathe Chucks, Tailstock Turrets, Bed Turrets, Files, Special Taps and Dies, etc.

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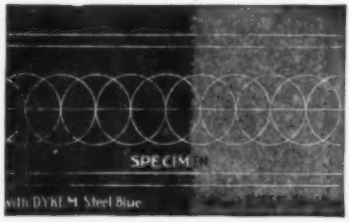

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making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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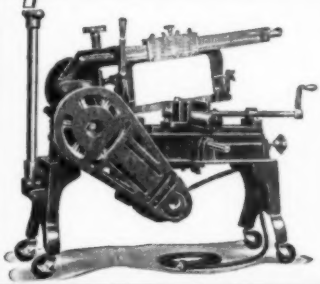

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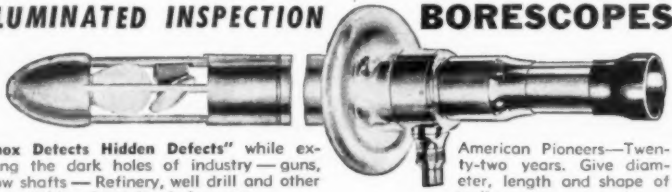

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American Pioneers—Twenty-two years. Give diameter, length and shape of cavity.

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WORK IN PROCESS IS ALWAYS ON THE MOVE

It's raised and lowered, shifted and placed; transported about the shop. Tools and dies move too; and assemblies and stock! ● Many of these moves require the strength of two or more men, resulting in idle periods on the "helpers" machine and risk of strain and injury to all involved. ● Solve this problem with PORTELVATOR, the Hamilton Portable Elevating Table! Raises and lowers, transports and height adjusts. Heavy tools and materials are ROLLED from place to place, raised or lowered to desired position and SLID from Portelvator to work surface. Saves time, strain and effort. Enhances profits. ● Made in three standard models to lift and carry 1,000 to 5,000 pounds. Special models designed for "outsize" requirements. Write for literature and prices . . . Address Department A-P.

THE *Hamilton* TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES
TAPPING MACHINES · PORTELVATORS

NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

WHEELABRATOR TUMBLAST CATALOG

Complete information on the new 60" x 96" Wheelabrator Tumblast is contained in Catalog No. 264 just published by American Foundry Equipment Company, 555 South Byrkit Street, Mishawaka, Ind.

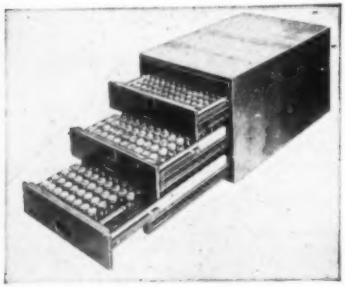
The 60" x 96" is, according to the manufacturer, the largest machine of its kind ever built, with a capacity of 63 cubic feet and will clean 6,000 pounds of steel castings in 15 minutes.

Detailed information including installation photographs, construction features, overall dimension drawings and specifications is contained in this 16-page catalog. General information and specifications on other Tumblasts in the American line are also included in this book.

GAGE SETS IN CABINETS

Precision gaging is an almost universal requirement in industry, and all activities of construction and service today. Users of gages in many cases, must have a wide range of units within immediate reach at all times.

To meet this necessity, United Precision Products Co., 3524 W. Belmont Ave., Chicago 18, Ill., has made available complete standard gage sets housed in durable cabinets, with features of most acceptable convenience.



Cabinet No. 500 contains 471 gaging members, sizes .030" to .500" in increments of .001—each member with its own plastic collet — seven new lightweight handles, and four drifts to fit all size ranges. Everything for any cylindrical plug gaging in above range is right at hand in the three-drawer cabinet. Gaging members are progressively stored, each in its own receptacle. Size of gage is stamped on collets for instant pickup.

Cabinet No. 600 contains 501 gaging members in four drawers. Sizes .500" to 1.000" in increments of .001. Plastic collets are included for each pin; also four of the new lightweight handles, and four drifts to fit all size ranges.

These cabinets are designed for toolroom service—with strength for constant use, and handsome walnut finish. Sliding drawers are double suspension ball-bearing equipped, Tumbler lock. Sizes: No. 500, 16"x25¼x12¾"; No. 600, 21-9/16" x 27⅛"x20". Gaging members are available in XX, X, Y, Z, and ZZ tolerances. UPP-CO-Lapped or chrome-plated UPPCO-Lapped.

REMOTE INDICATING DYNAMOMETER

The W. C. Dillon & Co., Inc., of 5410 West Harrison St., Chicago 44, Ill., are manufacturing a new remote indicating Dynamometer known as Tens-O-Trol. This is a new type of tension or weight measuring instrument that will, according to the manufacturer, have application throughout all industries.

Three claims made for the Tens-O-Trol are its excellent visibility, the dial itself is 9½ inches high with etched numerals 1 inch high and is brightly lighted along the edge; its sensitivity, the pressure beam requires a deflection of only 40 thousandths of an inch; and its fool-proof hook-up, each cable has a different number of conductors thus it is impossible to connect the system incorrectly.

WHICH DUST COLLECTOR?

Individual type Dustkop dust collectors suitable for collecting dust, dirt and lint from dry grinding, buffing, polishing, etc., are described in a new catalog, A-350, available from Aget-Detroit Company, 602 First National Bldg., Ann Arbor, Mich.

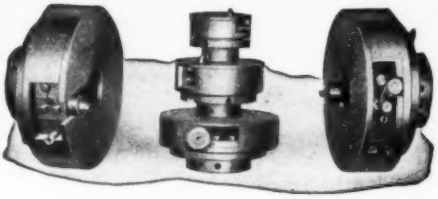
Also included in the literature is a Vapor Collector, designed to collect vapor from screw machines and similar machining operations employing coolants.

Specifications of models with ratings, together with prices of units and accessory equipment, are given in addition to illustrations of typical installations.

HIGHER SPEEDS IN DRILLING

Hyper-Drilling is described as a means of achieving speed and precision in mass production drilling. On laboratory test, the company says, a ⅜" hole, 4" deep was drilled in 5 seconds with the new "Jet" drill and "Jet" director.

Republic Drill & Tool Company, Chicago, exclusive manufacturers of the "Jet" drill and "Jet" director, have just published a new booklet on Hyper-drilling. A copy may be obtained by writing Republic Drill and Tool Company, 322 South Green Street, Chicago 7, Illinois. Ask for Bulletin J-2.



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FACING HEADS

with Automatic Feed

One-way Tool Feed — 6, 9 and 12" sizes.

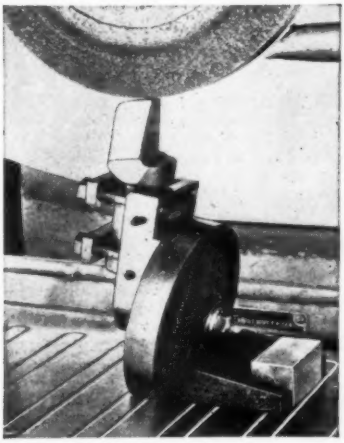
Two-way Tool Feed — 9, 12, 16, 20, 24, 30, 36, 40 and 46" sizes.

Save many costly set-ups.

Bulletin No. 4141 Gives Full Details

MUMMERT-DIXON CO., 122 Philadelphia St., Hanover, Pa.

ALL-PURPOSE TOOL GRINDER



The George Scherr Co., 200 Lafayette St., New York 12, N. Y., announces the development of an all-purpose tool grinding fixture for the precision grinding of lathe tools, screw machine form tools, shaper, planer, milling machine or any angle cutting tools. This fixture makes the grinding of all manner of tools a simple procedure so that anyone, even inexperienced help can readily operate it.

The All-Purpose works on a new patented principle involving the use of compound angles. It is placed on the magnetic chuck of a surface grinder and is firmly held in place by the magnetic power of the chuck thus eliminating the uncertainties of hand grinding. It is graduated by degrees up to 90 and angles both left and right may be readily obtained. In addition, and at the same time, the rake angle is ground on the tool by means of a tipping block, which gives you 3, 5, 7 and 10 degrees clearance.

The tool may be used to grind tools from 1/8" to 1¼" and is widely used for carbon, alloy and tungsten carbide tool bits. Both inside and outside threading and recess tools may be ground on the All-Purpose and form tools may also be ground, quickly providing the different cutting edges for various types of material.

CUB

VARIABLE SPEED TRANSMISSION

For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. *See your dealer or write* $16.50

(3 Types—8 sizes to choose from)

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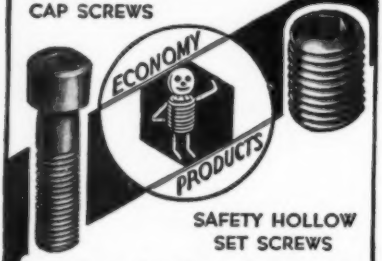

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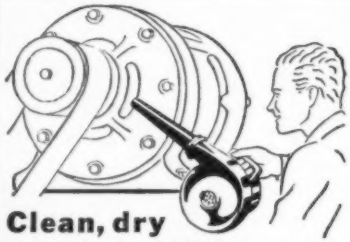

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Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

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Here's the Problem

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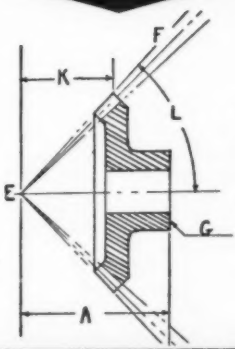
EASY BEVEL GEAR GAUGING

No Long Calculations

No Involved Set-up



With Herkimer sine bars and bevel-gear gauges, anyone with ordinary gauging experience and ability to read blueprints can quickly and accurately check all important bevel gear dimensions and relations. Production gauging made easy.

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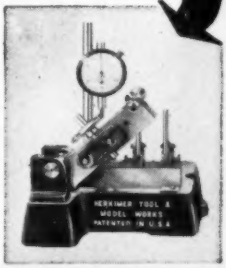
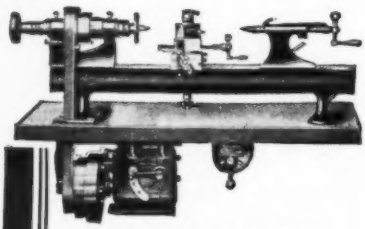


HERKIMER TOOL & MODEL WORKS, 108 King St., Herkimer, N.Y.

THE "Stark" PRECISION BENCH LATHES



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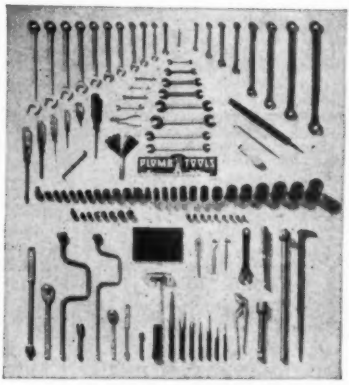
Dependable for long service on exacting work which they handle with facility and speed. Records of 20 years continuous service are not unusual.

Write us your requirements. Now 4 good sizes, ¼", ½", ¾" and 1" collet capacity.

Stark Tool Company
Established 1862
Waltham, Massachusetts
Originators of the American Bench Lathe

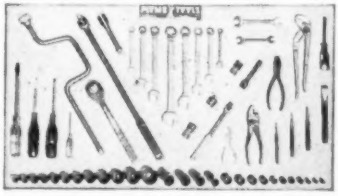
FREE TOOL SETS FOR WAR VET

Two especially selected tool sets for war veterans are announced by the Plomb Tool Co. The sets are obtainable free under the Government's Apprentice Training Program, which allows an ex-GI up to $100 worth of tools when he is approved by the local Veterans Administration office.



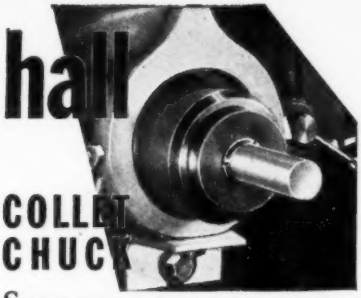
Final selection of the tools in each set followed a very careful study of the requirements of apprentice mechanics. They are suggested sets, however, and veterans have the option of making their own tool selections.

One set, contains 113 items and includes ¾" drive sockets and several large wrenches. The other set, contains 60 items. Tools in this set are the ones used most in the average shop. These sets can be



purchased only from Plomb distributors.

Full details on the veteran's procedure for obtaining tools and descriptions of the two sets offered will be sent free, write the Plomb Tool Company, 2209T Santa Fe Avenue, Los Angeles 54, Calif.



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SPEED UP production in multiple operations with push-out type Hall Collet Chuck. Full spindle capacity or over. Tremendous grip over or under stock size to .007—without adjustments... no bearings, friction, heat or loss of power. Instant release without stopping lathe.

Two-inch capacity, now only $145
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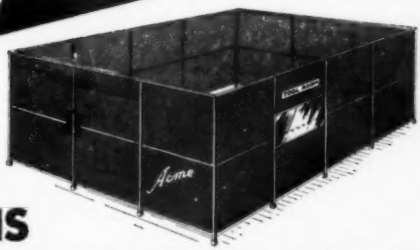

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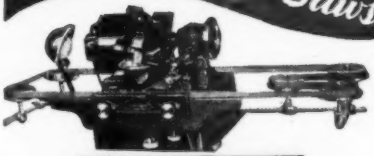

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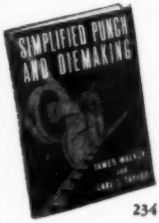

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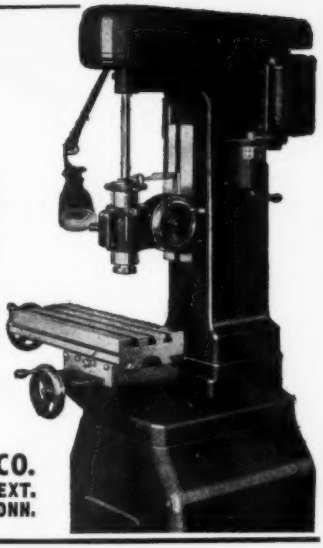
TOOLMAKERS' TIME IS VALUABLE ...SAVE IT...



No shop can afford to waste skilled toolmakers' time doing small die, jig, fixture, pattern and model work on large machines designed for heavier, costlier jobs. It can be done fast, accurately and economically on a Linley Milling and Jig Boring Machine.

Consider the practical factors in having 8 spindle speeds to 4250 r.p.m., velvet feed, anti-backlash quill travel, direct micrometer setting, floor space (18½" x 20") and (7" x 17½") table.

Your toolmaker appreciates these facts . . . ask him.

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Six Tool and Stop Positions!
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High Speed Cutting Tools

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Lincoln Park Manufacturing Co.

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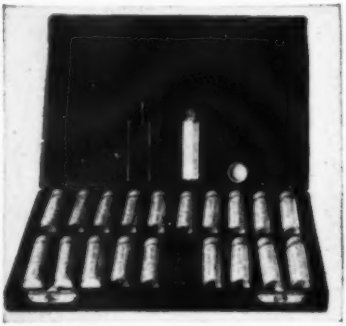
CARBOLOY GEAR WIRES

The Van Keuren Co., 176 Waltham St., Watertown, Massachusetts, announce a new set, No. 20-1.68C, carboloy gear measuring wires. The set includes 2 wires



each, from 7 diametral pitch (.240" diameter) to 80 diametral pitch (.021" diameter). The new 1.68 carboloy gear wire can be used for measuring both external and internal gears. The manufacturer maintains that since carboloy wears longer than steel, the new carboloy gear wires will retain their accuracy of .000025" for a long period of time and will not develop flat spots, gouges, or nicks.

Circular G 37, which includes accurate and up-to-date gear tables is furnished with every set of VK gear wires. These tables give the measurements over wires for 1 diametral pitch, external and internal spur gears from 5 to 500 teeth, and for pressure angles of 14½° 17½°, 20°, 25° and 30°

BOOKLET ON "ENGINEERED HEAT"

If the heating of metal is required in the manufacture of your product, you'll get a lot of good ideas from Salem Engineering Company's new booklet on "Engineered Heat." Designed for engineers and production men, this 16-page booklet contains descriptive information on circular soaking pits, various types of heating furnaces, and auxiliary equipment developed by Salem. It also includes a number of installation pictures, and easy-to-use tables and charts on temperature conversion and thermal efficiency of fuels.

Copies of this new booklet will be sent on request. Write to the Salem Engineering Company, Salem, Ohio.

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There's no cost for power or waste of floor space with Famco Foot Presses. Easily operated with speed and accuracy, they step up production on light punching and forming jobs. Made in 10 bench or floor type models. Write for folder.

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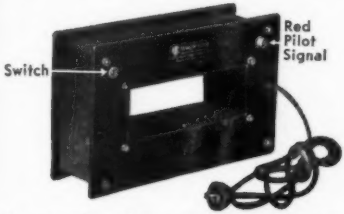

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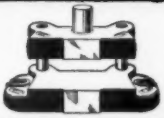

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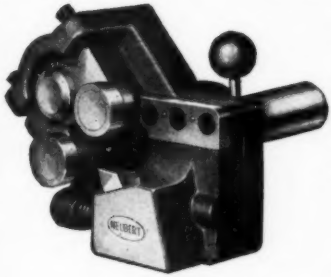

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IS THE BEST TIME SAVING TOOL USED ON TURRET LATHES AND SCREW MACHINES SET UP FOR BAR WORK. REMOVES LARGE AMOUNTS OF METAL QUICKLY AND PRODUCES WORK THAT IS SMOOTH AND ACCURATE.

CUT YOUR PRODUCTION COSTS WITH ROLLER TURNERS.

Immediate delivery

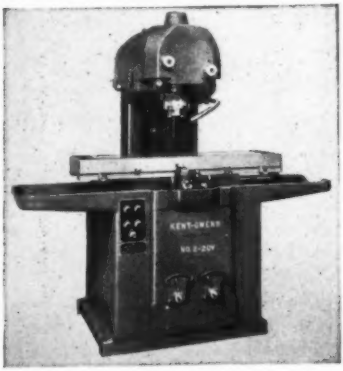
⅛ to 5/16″ capacity, 5/16″ shank	$ 68.00
3/16 to 1″ capacity, 1″ shank	85.00
3/16 to 1″ capacity, flange type	85.00
⅜ to 1¾″ capacity, flange type	110.00

NEUBERT MACHINE COMPANY

Precision Cutting Tools **341 W. Willow, Long Beach 6, Calif.**

NEW KENT-OWENS VERTICAL MILLER

A RECENT addition to their line of milling machines is a new Model 2-20 vertical, manufactured by Kent-Owens Machine Company, Toledo, Ohio.



Ruggedly built, the bed, column and head are all sturdy case members. A heavy table is guided by dove tail slideways directly cast to the bed so as to afford maximum support to the table which is 42" long by 12" wide with a 20" travel, having a fully automatic cycle. It can be fed or rapid traversed in either direction, automatically shifted from rapid traverse in either direction, and automatically reversed at both ends of the stroke. It may also be automatically stopped at any desired point in its travel.

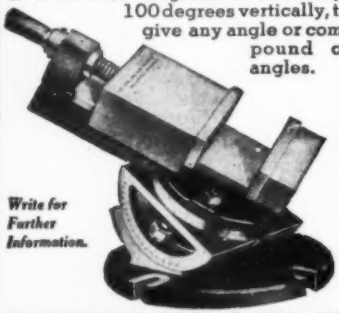
Independent adjustment of the feed rate for opposite directions of table travel is a feature which makes possible milling a part at one end of the table at a slow feed rate and also setting up an entirely different job at the other end requiring a faster feed rate. Similarly, this independent adjustment permits setting the feed rate exactly the same for both directions of table travel. The 2-20 Vertical Miller has a 4" micrometer adjustment on the quill. The standard machine has a maximum gap of 10" between the nose of the spindle and the table surface. Two other column heights are also available permitting maximum gaps of 12" or 14". This close-coupled construction, assures the selection of a machine with a gap best suited for specific jobs. Between the standard foot-mounted ball-bearing spindle drive motor and the cutter there are only three gear contacts.

New Britain

UNIVERSAL VISE

THE ORIGINAL

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



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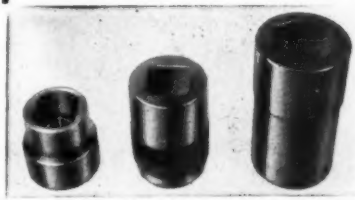
TOSCO HEAVY DUTY SOCKETS

MADE TO ORDER



SUPER STRENGTH SOCKETS For AIR, ELECTRIC OR HAND WRENCHES

Popular sizes carried in stock with ½, ¾ and 1 inch square drive.

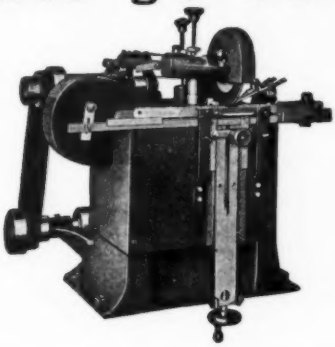
Made of special alloy steel heat treated to our formula.

Heavy inner rib reinforces each socket.

TOOL SUPPLY CO.

40 Custer Ave. Detroit 2, Mich.

Saw blade replacement costs go down



Time and again the E.C. all purpose metal cutting hack, band and circular saw grinder has paid for itself within a year following its installation.

Not only do blades last longer but experience has shown that when a tooth is ground with the E.C. combination grinder, it will take a maximum bite with minimum destructive effect on tooth. Down time is cut to a minimum. Write for E.C. bulletin.

THE **WARDWELL** MANUFACTURING CO.
3165 Fulton Rd., Cleveland 9, Ohio

NEW GAGE SAVINGS!

SCHNACKE *ADJUSTABLE* FLUSH PIN GAGE

With this new adjustable gage, you can have an accurate Flush Pin Depth Gage quickly and save time and money. Serves many varied gaging purposes in production and inspection. Set consists of 3 interchangeable depth rods (1"-2"-3") and 1" diameter sliding anvil, adjustable to required depth. Sliding tolerance feelers at the top are set with micrometer screw from plus or minus .000 to .200 and locks firmly with double locks. Standard set applicable to any decimal dimension up to 3.00".

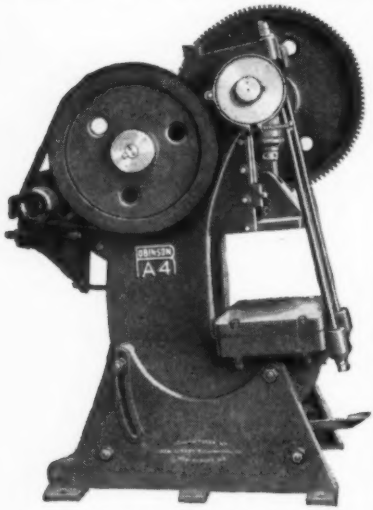
Special anvils and longer rods are also available. Write for descriptive circular.

SCHNACKE, INC.

1018 E. Columbia St. Evansville, Ind.

Long Recognized

for durability strength and service



● The new improved Series A Robinson Punch Presses retain all the sturdy characteristics of their predecessors with added safety, speed, strength and ease of operation and maintenance. Available in five sizes.

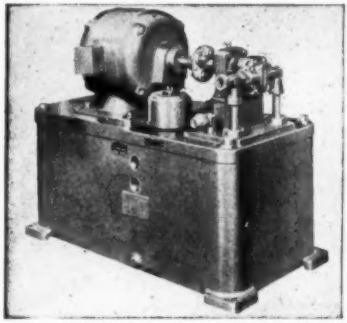
Send for descriptive Bulletin No. 7.

New Albany Machine Mfg. Co.
New Albany, Indiana, U.S.A.

ROBINSON
Inclinable
PUNCH PRESSES

LIGHT DUTY HYDRAULIC PUMP

The Barnes F-10-A and F-20-A Hydraulic Pumping Units have been announced by the John S. Barnes Corp. of Rockford, Ill.



The Barnes F-10-A is intended for light duty machines and is designed for mounting on the machine itself or on a separate base. The oil capacity for this model is 9 gallons, its maximum pump delivery is 5 GPM, and its maximum gage pressure is 500 psi.

The Barnes F-20-A was designed to handle a wide range of machine operations according to the manufacturer. A Barnes Roto-Blade Pump which is direct driven by the motor develops fluid power and pressure is limited by a Barnes hydraulically balanced pressure relief valve. The oil capacity for this model is 27 gallons, its maximum pump delivery is 12½ GPM, and its maximum gage pressure is 1000 psi.

X-RAY FOR FOUNDRY CONTROL

A new 4-page folder (No. R1023) titled "X-ray As a Foundry Control Tool" is available from the North American Philips Company, Inc., 100 East 42nd Street, New York. The text was written by George Mullowney, industrial radiologist, who describes in detail the principles of operation together with informative cost analyses. Specific topics covered include: 1. How X-rays are produced. 2. Equipment costs. 3. Small casting production. 4. Fluoroscopy. 5. Personnel. 6. Operational costs.

Pictured are six radiographs which show the most common defects encountered in magnesium castings. Additional drawings and charts make the subject matter easy to understand.

INTERCHANGEABILITY

Your KEY to
MASS PRODUCTION
Will Speed up Drilling
and Lower Costs

A. S. A. STANDARD
PRECISION DRILL JIG BUSHINGS

Standard sizes and styles in stock for prompt delivery. Write for catalog showing table of standard sizes of bushings with price list and other valuable information for the tool designer.

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J. W. Mull, Jr.
GArfield 8017

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ACCURATE BUSHING COMPANY, 440 North Ave., GARWOOD, N. J. WEstfield 2-2415

"DUPLEX" Nut Slotter!

Adaptable to Milling of parts of various shapes and sizes . . .

SLOTS 2 SIZES AT ONCE. TWO CONTINUOUSLY OPERATING CONVEYORS. AUTOMATIC BURR REMOVAL . . AS HIGH AS 3000 SLOTTED PARTS PER HOUR.

PELLOW MACHINE Co.

13510 FOLEY AVE., DETROIT 27, MICH.

Producers of Screw Machine Products to Specifications

ONE, FOUR and SIX spindle automatics maximum capacity 2⅝" round. Hand Screw Machines and Universal Turret Lathes maximum capacity 3" round. Castings and Forgings machined maximum 10" diameter, 8" length, 15 pound weight. Secondary operation equipment for milling, drilling, tapping and assembling. Fabricators of aluminum, brass, steel and their alloys.

Screw Machine Specialty Co., 5600 Butler St., Pittsburgh 1, Pa.

Speediest Way to
LOCATE CENTERS
for Precision Drilling

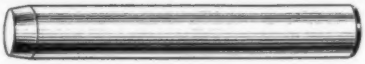
OPTICAL
CENTER ⌖ LOCATOR

Ingenious Center-Locator saves time and makes your drill press do the work of a jig boring machine. Now you can drill and space holes to within .001" . . . drill round holes in thin material . . . avoid drill run-outs . . . counter bore holes with ordinary drill. Enthusiastic machinists claim it is the simplest, speediest, most positive and accurate method of locating centers and drilling holes yet devised. Simply layout work with height gauge, locate center through the powerful magnifier—then replace it with any of the 16 drill bushings furnished. Ask your mill supply house, or order direct.

Literature on Request.

MASTER SPECIALTY COMPANY
3014 E. LAKE ST. • MINNEAPOLIS 6, MINN.

DOWEL PINS



Immediate Delivery!

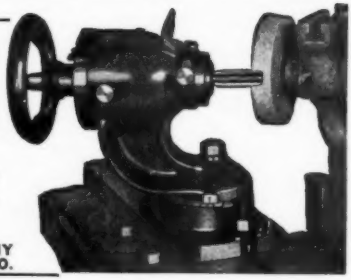
Standard Size Dowel Pins from ⅛" to 1" diameter and from ⅜" to 6" length supplied in .0002 and .001 over basic sizes. Unless otherwise specified, .0002 oversize will be furnished.

SCHULTZ & ANDERSON CO.
109 Edison Place, Newark 5, N.J.

HYBCO GRINDING HEADS
For Universal Tool and Cutter Grinders

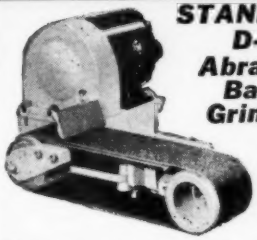
CHAMFER SHARPENING HEAD ⟹
Accurately Relieves Chamfers of TAPS—STEP DRILLS—CORE DRILLS—COUNTERSINKS—similar tools with evenly spaced flutes.

⟸ **FLUTE SHARPENING HEAD**
Sharpens Straight or Angular Flutes — GUN OR SPIRAL POINTS OF TAPS — Other tools with evenly spaced flutes.



Write for Circular MTH
HENRY P. BOGGIS & COMPANY
1279 W. 3rd St., Cleveland 13, O.

STANDARD
DIAMOND
TOOLS
for 73 makes
of machines
J. K. Smit & Sons puts the finest in diamonds, materials and workmanship into every standard and special tool. Count on exact dimensions in tools for each of 75 makes of machine. In ordering, just mention grinder manufacturer's name and type of grinder.
J.K.SMIT & SONS Inc.
157 Chambers St., New York 7, N. Y.
6400 Tireman Ave., Detroit 4, Mich



STANDARD D-4 Abrasive Band Grinder

Famous for Stamina

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

WALLS SALES CORP.
306 E. 38th St., New York 16, N. Y.

Why BREAK 'em ?

HOW MUCH DOES IT COST YOU TO REPLACE BROKEN DRILLS, TAPS, REAMERS, ETC.?

Added to losses due to work spoilage, labor of extracting broken pieces and production line tie-ups, it can be a formidable total.

Machine Tool Type Production Model

You can cut these mounting losses easily by the use of BUFFALO TORQUE CONTROL COUPLINGS. Adjusted at a fixed torque to perform a particular operation, these couplings automatically throw out when overloaded, thereby releasing the driving power thru the couplings themselves, but automatically re-engaging and re-assuming the driving power when the over-load has been removed.

Available in production and utility models, in sizes for all operations on drilling machines, lathes, turret lathes, boring mills, etc. Also manufactured as stud drivers, nut setters and transmission types.

Descriptive Bulletin No. 1007 sent on request

BUFFALO MACHINERY CO., INC.
838 Grant Street Buffalo 13, New York

DIE CASTING MACHINES

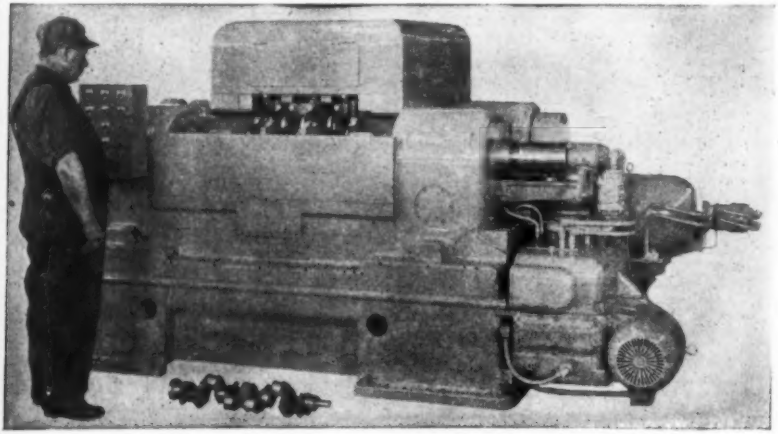
The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio announces two new high pressure die casting machines for casting magnesium, aluminum and copper alloys. These new self-contained machines are of revolutionary design in that mold clamping, metal injecting, core pulling and ejecting units are all operated by direct hydraulic means.

H-P-M high pressure die casting machines have injection capacities from 12½ to 100 cu. in. per cycle. Injection pressures from 6,000 to 50,000 psi are available, depending upon plunger diameter. Two standard machine models, the 400-A (aluminum) and the 400-M (magnesium), are now being produced.

One of the design features of these new H-P-M high pressure die casting machines is the straight-line hydraulic clamp used to seal the mold halves during the injection part of the machine cycle. The double acting main ram is equipped with a small internal booster ram which provides for rapid advance of the movable mold half. Just prior to mold contact, the closing speed is automatically reduced, thus eliminating slam and shock to the mold halves. The clamp pressure, clamp stroke, and position of the slow-down are all adjustable. No locking devices are required to hold the mold halves in their closed position. The machines are provided with a hydraulic knock-out in the mold clamp platen. Hydraulic pressure is also available for pulling cores automatically. Control of the H-P-M die casting machines is semi-automatic, the operator starting each cycle by means of an electrical foot switch. The balance of the cycle is automatic.

CRANKPIN TURNING LATHE

A new product Wickes Bros., Saginaw, Mich., has just put on the market is an Automatic Multiple Crankpin Turning Lathe of the single spindle type. This machine is designated as the Wickes Model MP-4 and a full view is shown in illustration, is of a size suitable for accommodating all automotive type crankshafts. Tooling which consists of roller supported type tool holders for each crankpin, hydraulically operated pot chucks which hold and drive crankshaft from each end and hydraulically operated steady rests for supporting crankshaft where required. Tool feed is hydraulic and lathe is completely automatic in operation from press of start button to stopping of spindle in unloading position.



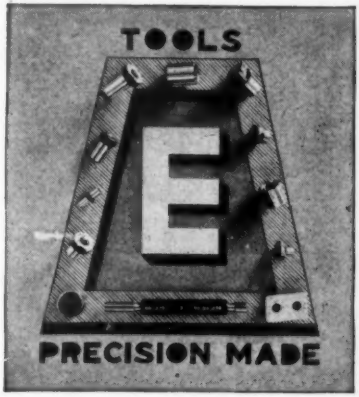
DRILL JIG

BUSHINGS

A.S.A. STANDARD types and sizes in stock for immediate delivery.

Excellent delivery on NEW GAGES and GAGES salvaged by HARD CHROMIUM PLATING.

Write today for particulars



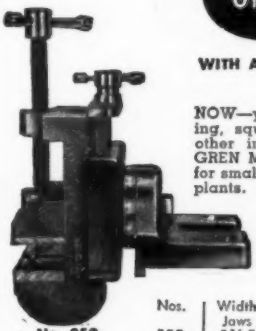
ECONOMY TOOL & MACHINE CO.

MILWAUKEE 14, WISCONSIN

MILL IT ON YOUR LATHE

WITH A **PALMGREN**

MILLING ATTACHMENT



NOW—you can do milling, slotting, grinding, grooving, squaring shafts, sawing at angles, and many other important operations on your lathe. PALMGREN MILLING ATTACHMENT is a necessary fixture for small shops, schools and emergency work in large plants. Fits South Bend, Atlas, Craftsman, Logan, Sheldon and all other makes. It has 360° graduation for rotary angle adjustments, also graduated feed and adjustment screw. Easily mounted by straddling lathe's regular tool post. Try one—it will quickly pay for itself.

IMMEDIATE DELIVERY

Nos.	Width Jaws	Depth Jaws	Jaws Open	Weight Pounds	Base Opening	Price F.O.B. Factory
150	1⅛"	1"	1⅝"	6½	1"	$18.75
250	2½"	1⅞"	2½"	11	1¼"	24.75
400	4"	1½"	4"	25	2"	39.75

No. 250

Order from your dealer or jobber. Write for circular No. 350.

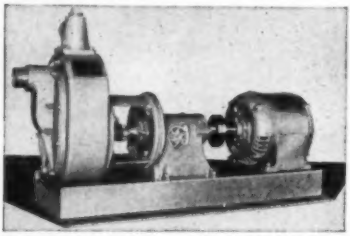
CHICAGO TOOL AND ENGINEERING CO.

Mfrs. of PALMGREN PRODUCTS for over 28 Years

8384 South Chicago Avenue • Chicago 17, Illinois

SELF PRIMING CENTRIFUGAL PUMPS

Expanded production of self-priming centrifugal pumps has been announced by Marlow Pumps, Ridgewood, N. J. Of special importance are the Marlow "Type E" industrial pumps. These are electric and belt-driven self-primers made in sizes to handle 50 to 4000 gpm.



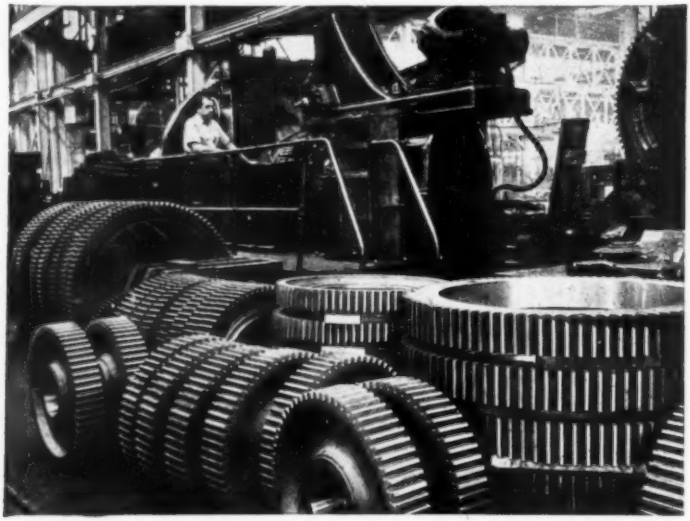
Because of a unique diffuser design, the pumps prime and reprime automatically without recirculation or the use of any auxiliary mechanical devices. As in regular centrifugals, the impeller alone moves the liquid; thus they combine to a high degree the efficiency of centrifugal pumping with dependable, automatic action. Marlows are made with 1½ to 10-inch fittings, and are said to operate on heads 10 to 150 feet. They handle clear, gritty, warm or volatile liquids.

CONE-DRIVE GEAR SETS

A 16-page catalog, No. 700 describing its complete new line of standardized carried-in-stock Cone-Drive gear sets has been issued by Michigan Tool Company, 7171 E. McNichols Road, Detroit 12, Mich.

Standardization of gear sets has made possible reductions in costs, simplified ordering and expedited deliveries. Furthermore it has eliminated the necessity for gear designing and calculations as to bearing sizes and locations, etc.

The catalog lists various sizes ranging from a center distance of 2 inches to a center distance of 18 inches, and in ratios ranging from 5:1 to 70:1. The standards cover a range of from .06 hp at 100 rpm to 800 hp at 2400 rpm based on Class 1 service.



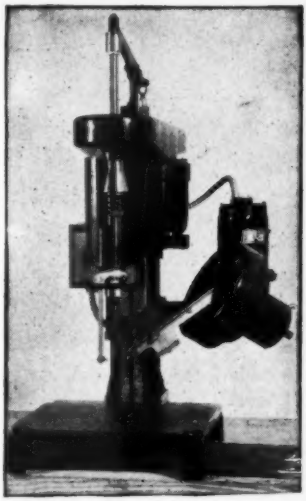
GEARING FOR THE RAILROADS—Rim gears for electric locomotive drives and solid spur gears for Diesel electric service await inspection and shipment at the Nuttall Works of Westinghouse. Two types of rim gears are in evidence:—those with ground finish bores are pressed on the drive mechanisms, while others have bolt circles to facilitate mounting. In the background, Charles Weinstein finishes the teeth on a grinder.

No. 2 To No. 6

Screws Driven on this Husky but Sensitive Hopper Feed Screwdriver.

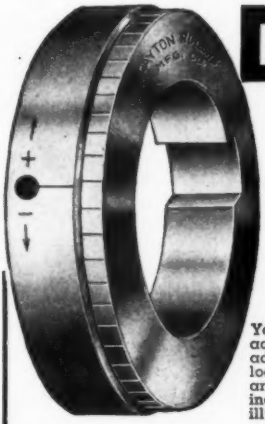
No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

Drives screws at one second each.



DETROIT POWER SCREWDRIVER CO.

2809 West Fort St., Detroit 16, Mich.



FAST, ACCURATE SPACING

for

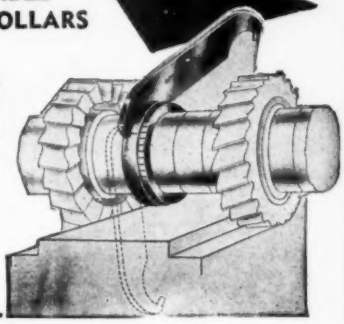
SIDE MILLING CUTTERS

GANG MILLING SET-UPS

Graduated in thousandths, you have plus or minus .0005" at your fingertips with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

You can make an accurate, positive adjustment just by loosening the cutter arbor nut and making adjustment as illustrated.



Made in 12 standards for cutter arbors from ⅞" to 2". Write for illustrated Bulletin 120-7.

DAYTON ROGERS MFG. CO.

2849 12TH AVE. SO., MINNEAPOLIS 7, MINN.

NOW

AVAILABLE

NEW

Fully Automatic

Easy Cleaning

DIE HEADS

Automatically opens at a predetermined length of thread.

Instantly withdrawn from stock without reversing machine.

Instantly set from a rough cut to a finish cut of thread.

Button dies quickly changed.

Less set-up time. Low cost.

Accurate speedy thread cutting is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment, and makes this modern DIE HEAD the ideal general purpose thread cutting tool. For tough threading jobs where constant uninterrupted operations are essential, the BHICO DIE HEAD will do them.

No fussy adjustments to be made; Dies removed by loosening of two screws.

In ordering BHICO DIE HEADS, specify DIE HEAD size and diameter of shank.

Ask your Dealer or order direct.

Write For Details, Circular C-1

B-H INSTRUMENT CO.

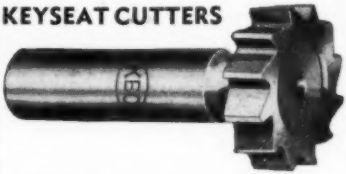
3321-23 AVENUE S BROOKLYN 10, N.Y.

KEO

CENTER DRILLS

Made of finest high speed steel. Available in all standard sizes. Always in stock for *immediate delivery*. Specials made to your specifications.

KEYSEAT CUTTERS



High speed. Right hand. ½" shank. Diameters from ¼" to 1½". Standard sizes in stock for immediate delivery. Complete set —41 sizes—available in sturdy, hardwood box. Saves time and money, because you always have the size you need.

CENTER REAMERS

High speed steel. Reamers from ¼" to 1" regularly furnished with 60°, 82° or 90° included angle. Specials made to your specifications.

LATHE MANDRELS

Precision made of tool steel, hardened and accurately ground. Tapered .0005" to the inch. Mandrels from ⅛" to 1" are .0005" undersize at small end, from 1⅛" to 3", .001" undersize. Immediate delivery.

Write for Literature

Illustrated literature and prices on all KEO Products mailed on request.

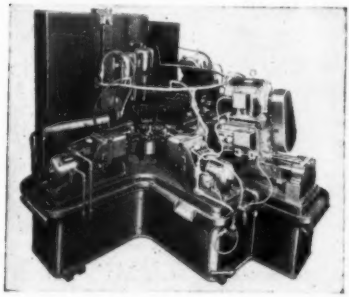
KEO CUTTERS

19326 Woodward - Detroit 3 Mich.

Let's Talk Shop

SPECIAL 7-STATION MACHINE

Herewith is shown a new special-purpose machine designed and built by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Michigan. This machine has an estimated production of more than 100 cycles—over 200 parts—an hour at 80% efficiency.



Each fixture on the seven stations clamps two parts—one left and one right. The operations performed are drilling, reaming, tapping and two-way rough and finish boring, these operations being performed by a series of units arranged around an automatically operated index table.

CARBIDE GAGE BLOCKS

Fonda Gage Co., Stamford, Conn., manufacturers of gages and steel and Lifetime Carbide gage blocks, announce the introduction of a complete 82-piece set of carbide gage blocks—the Fond Lifetime-Carbide Gage Block Set. The manufacturer states that these blocks are made of finest carbide, extremely abrasion-resistant, and specially processed to prevent chipping and cracking. Their extreme resistance to abrasion not only minimizes the danger of damage from improper handling, but also extends the use of these gage blocks in the shop, allowing one set to be rotated in use in tool room, shop, and inspector's office.

When used in a temperature-controlled room, the temperature difference between steel and lifetime-carbide is zero; no temperature correction is necessary when temperature is not controlled, provided the work is held to one ten-thousandth. When closer tolerances must be held, reference is made to a simple temperature expansion table accompanying each set.

Blocks can be wrung dry and absolutely clean. They can be readily used at the machine because they withstand vibration. No protective coatings are necessary, since the blocks are corrosion-and acid-resistant.

Sizes in the 82-piece set range from .050″ to 4.000″, including a .10005″ block which makes possible sizes of one-half of one ten-thousandth of an inch, with 480,000 possible combinations. All blocks up to 1″ are solid carbide; 2″, 3″, and 4″ blocks are carbide-tipped. These sets, as well as individual blocks, are manufactured and sold in three grades: "AA" (±.000002″), "A" (±.000004″) and "B" (±.000008″).

ELECTRODE HOLDER

Twecotong is a product of the Tweco Products Co., Wichita 7, Kansas, is a conventional long type electrode holder; however, it features molded-laminated glass cloth Bakelite insulation keyed to the holder casting. Tensioning spring

firmly seats on fibre upset washers and is protected from spatter by non-binding Neoprene tubing. Ventilated fibre handle, together with good cable connection assures a cool running holder. All parts are replaceable.

Split thousandth ACCURACY on locating problems with OPTICS

Whenever you bore, turn or mill to layouts, set up your job with OPTI-LOCATOR, the modern, time-saving optical tool that assures split-thousandth results before the job is commenced.

Sight OPTI-LOCATOR from a convenient position—no squinting—no eyepieces. Use OPTI-LOCATOR on lathes, vertical and horizontal mills, jig borers, drill presses, etc. Rejects source of errors before they occur ... actually corrects for spindle runout in worn machines.

Small, simple, compact—nothing to wear out or get out of order. Assures jig-boring accuracy for

only

$24.50 complete!

Order through any authorized distributor or write direct.

FREE BULLETIN!
Describes OPTI-LOCATOR, accessories and applications. Send for free copy today!

THE BENTON COMPANY
DEPT. B.
351 S. LA BREA AVE., LOS ANGELES 36, CALIF.

SHUT-OFF VALVE

The Ross Operating Valve Company, 6480 Epworth Boulevard, Detroit 10, Mich., has announced the addition of a shut-off valve to their already large line of poppet type, air operated valves.

This new valve was primarily designed for use in air lines but is also recommended for use in gas and low pressure liquid lines.

Mr. John Sainsbury, general manager of the company, tells us that five outstanding features of this new valve are: (1) Full flow, that is to say, full pipe area. (2) Quick acting, just a flip of the lever opens or closes the valve. (3) Self-locking, locks automatically in both closed or open position. (4) Positive shut-off, line pressure provides leakproof seal. (5) Visual indicator, position of shut-off lever indicates whether valve is closed or open.

Four standard sizes are now in production, 1¼", ⅜", ½" and ¾".

COMPRESSED-AIR CHECK VALVE

Protection from accidentally disconnected or ruptured air lines is now provided through the use of the Numatic Safety Check. According to E. D. Bullard Co., of 275 8th St., San Francisco, Cal., this new product eliminates the danger from wildly whipping compressed-air hoses by shutting off the air immediately. This is also protection to compressors and manifolds as it prevents travel-back of the whipping action in the hose.

Other points in favor of the Numatic Safety Chuck, it stops the practice of crimping the hoses to shut off air while changing tools, also bad leaks in the lines are revealed before they can cause damage.

The Numatic Safety Chuck is manufactured for working pressures up to 250 pounds, and comes in standard half-inch and three-quarter inch sizes.

STANDARD PARTS

FOR JIGS, FIXTURES, DIES, GAGES, TOOLS AND MACHINERY

Featuring Hand Knobs, Quarter Turn Screws, Spherical Washers, "C" Washers, Jig Feet - Locating Keys

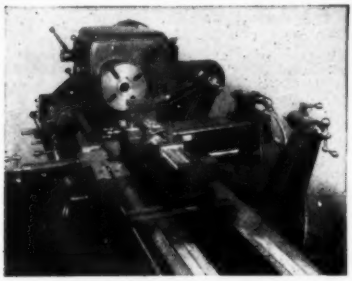
Write for Catalog No. 2

Inquiries for Tool Die and Mold Estimates Invited.

GEORGE F. BUB AND SON
3524 Krather Ave. Cleveland 9, Ohio

HYDRAULIC PROFILING MACHINE

The Springfield Machine Tool Co. of Springfield, Ohio announces a Hydraulic Profiling and Duplicating machine.



Duplicating mechanism arranged to work at right angles to spindle. Forming and duplicating with a cross feed.

It is shown here as an integral part of a Springfield 20 inch medium duty lathe on an 8 foot bed. However, other sizes are available depending upon the size of the work.

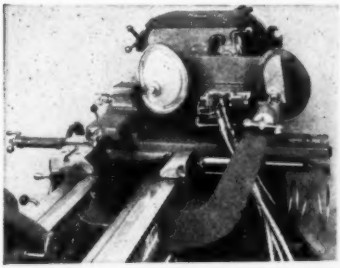
The machine will duplicate any job from bottle moulds to complicated cam forms and will make either interior or exterior duplication.

Any type of template may be used. Two brackets are standard equipment and these are adjustable on machined and hand scraped ways on the rear of the bed. Templates requiring rotation are driven by means of adjustable chain drive directly off spindle, and drive mechanism is amply guarded by metal guards.

Twelve spindle speeds are obtained by three levers on the front of the headstock. These speeds are further reduced, when required, by means of a two-speed motor.

Most of the duplicating mechanism is carried on the cross slide which overhangs the rear of the bed enough to mount the stylus control valve on top of slide. This valve swivels to accommodate the various contours. On the under side is mounted the master hydraulic cylinder, which is controlled by the stylus, for duplicating work running parallel to the machine spindle. Another master cylinder is furnished for duplicating work which runs at right angles to the spindle. This cylinder is attached to the cross slide inside the machine ways.

The hydraulic pump unit, is separate and may be located convenient to the machine. Flexible pressure hose connects pump with master cylinder and control valve stylus.



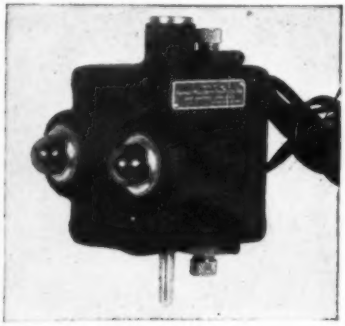
Contour cam turning using a revolving flat, thin sheet metal template.

It is a simple matter to disengage profiling arrangement, insert regular cutting tool, and operate the machine on regular lathe work. The usual stop collar on feed rod will disengage feed at any predetermined position.

For Today's Terrific WEAR and TEAR!
Abart GEARS
Come to Abart gear headquarters with your problems. Any gear material, any quantity, small or large. Cut to specifications only.
Write for Gear Bulletin
Abart GEAR & MACHINE CO.
4832 W. 16th ST. CHICAGO 50, ILLINOIS
CUTTING BEVEL GEARS

LIGHTRONIC GAGE HEAD

The Yankee Precision Products Co., of 50 Bartholemew Ave., Hartford, Conn., announce a new electronic self contained gage head for direct connection to 110 volt circuit without the use of transformers, tubes or rectifiers. Gage is complete within itself with plus and minus



lights which will operate within a gage setting of .00001. The head can be attached to users support or stand or arranged to suit any specific application. If close nesting of heads is necessary the light brackets can be removed and placed in a panel which then allows a total width of head of 7/8".

The gage spindle is frictionless and contacts are made without any multiplication leverage and is accomplished through an electrical gas contact eliminating completely any tendency of contact sparking.

Close adjustment of plus and minus setting is accomplished through a differential screw, and means provided to lock the setting.

The complete unit is approximately 2¾" square.

HEAVY UNIVERSAL FLY CUTTERS

Two new Extra Heavy models of the New-Field Universal Fly Cutter, designed especially for application on shell end mill arbors, are announced by the New-Field Machined Parts Co., 549 Randolph Street, Chicago, Illinois. They are 1⅜" thick, 6" and 8" in diameter, allowing ample strength for machining driving slots and counterbores. They use 4 removable high-speed steel or carbide bits. They are provided in all standard arbor sizes which can be machined to fit any individual arbor.

THE DRILL WITH A HUNDRED AND ONE SPEEDS

ALL SPEEDS INSTANTLY AVAILABLE WHILE MACHINE IS RUNNING

TWO MODELS
M125—3/8 CAP.
M96—7/8 CAP.

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HARTFORD, CONN.

BURKE
MILLING MACHINES
Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

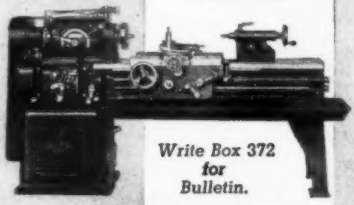
Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

CARROLL AND JAMIESON LATHES
15" AND 16"

12 Speed Geared Head Motor Drive Timken Mounted Spindle.

Modern Design—Liberal Dimensions.



Write Box 372 for Bulletin.

THE CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA • OHIO, U.S.A.

MODEL 175 HYDRAULIC MARKING MACHINE

QUICK MARKING FOR PART NUMBERS

MARKING BY ROLLING IS FAST . . . ECONOMICAL . . .

Identification numbers have become an essential factor in production. With this machine you can mark flat surfaces as well as around peripheries on your various components. Trade marks . . . Names . . . Instructions, etc., are *permanently* rolled into your parts. Send prints showing parts, desired marking and its location on the part for quotations.

DESIGNED AND MANUFACTURED BY

GEO. T. SCHMIDT, INC.
1802 W. BELLE PLAINE AVE.
CHICAGO • 13 • ILLINOIS

GTS

INJECTION MOLDING OF RUBBER

The HPM Turbojector for the injection molding of mechanical rubber parts is described in a new bulletin, No. 4601, which is available to BLUE BOOK readers. It describes in detail the operating and production features of this machine. Copies may be secured by writing the Hydraulic Press Mfg. Company, Mount Gilead, Ohio.

PRESSURE-COMPENSATING RINGS

Green, Tweed and Co., claim that the tendency of some types of "V" shaped packings to weaken and split at the "hinge", appears to have been overcome by a new design which includes heavier wearing surfaces. Known as Palmetto Pyramid Packing, this new product is available in molded ring form, made to exact dimensions.

The bottom ring is installed first and receives the full impact of the pressure on the power stroke. This bottom ring expands the wedge-shaped lip of each ring above it so that the packing is pressed against both the rod and side walls, preventing leakage. Binding is prevented by infiltration of fluid between the rings and storage of fluid in the arrowhead reservoir. Ease of operation is assured by the curved design of the interior lip surface which also prevents friction within the packing.

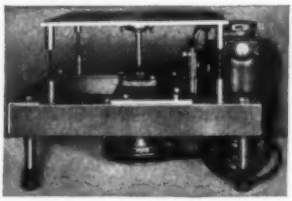
On the return stroke the lessening of pressure permits the built-in restitutional property of each ring to exert itself, thereby enabling the rings to instantly spring or contract to normal.

Palmetto Pyramid Packings may be used in any stuffing box, for rotary as well as reciprocal action. Sets of the rings can be supplied in styles and grades to withstand oil, water, and steam at any pressure, and temperatures to 600°F.

Literature on these packing rings may be secured by writing directly to Greene, Tweed & Co., Bronx Blvd. at 238th St., New York 66, N.Y.

SPEEDY THREAD CUTTING

The Lawrenz Thread Faster retracts the tool bit from the work at precisely the same point each time a thread is cut or chased on a lathe. This permits the lathe to be run at top speeds and the use of carbide tipped tool eliminating the danger of overrunning, tool breakage and damaging of materials. The Thread Faster is recommended for production runs not sufficiently large for automatic equipment—on jobs where threads must run up to a shoulder—in all metals, or in plastics. For further information write Peerless Tool & Engineering Co., 4446 Haddon Ave., Chicago 51, Ill.



N E W

The latest in Vibrating Machines now at a price within the reach of every manufacturer interested in "break-down" testing.

"Vibration Testing" shows up the weak spots and points the way to better products at lower costs.

"Vibration" or "Break-Down" testing is the modern method of final testing! Is your product assembled correctly? Is every bolt or rivet tight? Will the welded joints hold? Will it withstand the bumps and shocks experienced in shipping. Will it stand up in actual use? Trulap Vibrators will answer these questions for you.

Among the products now being "shock tested" by leading manufacturers are Radio Sets and Phonographs, Electronic Devices, Telephone Apparatus, Typewriters, Sewing Machines, Motion Picture Projectors and Cameras.

Trulap Vibrators will handle loads up to 150 Lbs. at 550 C.P.M.

Trulap Vibrators are precision made, ball bearing throughout.

Price complete with ¼ H.P. 110 V. A.C. motor $175.00 FOB N. Y. C.

TRULAP MACHINE COMPANY

17 West 60th Street **New York City 23, N. Y.**

Manufacturers of "Trulap Jr", the surface lapping machine that is attached to a drill press

Some territory still open for Sales Representatives.

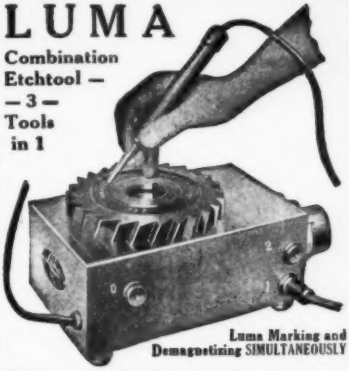
NIELSEN
Heavy Duty *Live Centers*

Write for catalog on live centers

Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

LUMA
Combination Etchtool — —3— Tools in 1



Luma Marking and Demagnetizing SIMULTANEOUSLY

Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

Send for details—5-day FREE TRIAL OFFER!

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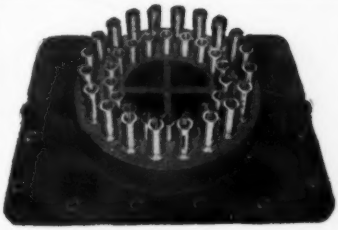
Dept. H P. O. Box 132, Toledo 1, Ohio

Cincinnati's LARGEST
HOTEL GIBSON
Famous for Friendliness

Randall Davis, General Manager



Pictured: a 38-Spindle Heavy-Duty Drill Head.

DESIGNERS AND MANUFACTURERS OF MULTIPLE DRILLING EQUIPMENT

We invite your inquiry.

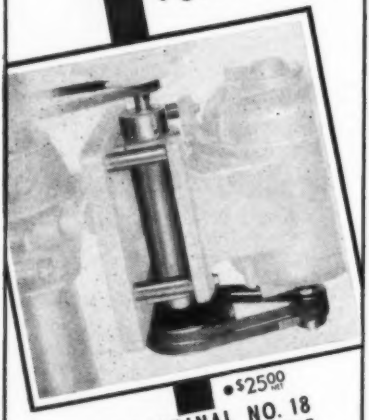
MICHIGAN DRILL HEAD CO.
971 E. 8 MILE ROAD HAZEL PARK, MICH.

the new.....

CARDINAL NO. 18

SLO-DRIVE

- DOUBLES
- DRILL PRESS
- CAPACITY



•$250.00 NET

THE NEW CARDINAL NO. 18 "SLO-DRIVE" REDUCES SPINDLE SPEEDS OF POPULAR 18" TO 20" DRILL PRESSES TO A RANGE ACCOMMODATING DRILLS AND OTHER TOOLS UP TO 1" DIAMETER OR LARGER. UNIT RUGGEDLY CONSTRUCTED, INTERCHANGEABLE, EASILY INSTALLED. COMPLETE SPECIFICATIONS UPON REQUEST.

CARDINAL MACHINE COMPANY

GLENDALE, CALIFORNIA

THE "SPEED-VISE" MANUFACTURER"

MINIATURE MAGNIFIER

A new miniature magnifier has just been placed on the market by Edroy Products Co., 480 Lexington Ave., New York 17, N. Y., manufacturers of optical and photographic products.

A small, compact, well-made unit which measures 1¼" wide by 2¼" long, weighing only three-fourths of an ounce, the Mini-Mag as it is called, is small enough to carry easily in a vest pocket or purse.

Having a magnification of 3½ times when counting the object as one, Mini-Mag, because of its extreme clarity and lack of distortion, and the fact that the convex side is ground to ten diopters, makes it twice as powerful in magnification as many other hand magnifiers.

SENSORY TORQUE WRENCHES

The P. A. Sturtevant Co. of Addison, Illinois, announces the addition of four new models to their Sensory Line of Torque Wrenches. They are as follows:

Model S200 having capacity 0 to 200 foot pounds, calibrated in 5 foot pound steps.

Model S300 having capacity 0 to 300 foot pounds, calibrated in 10 foot pound steps.

Model S2400-I having capacity 0 to 2400 inch pounds, calibrated in 50 inch pound steps.

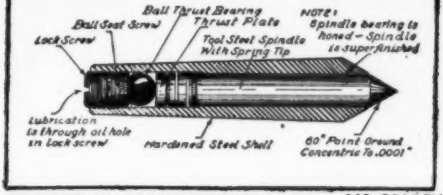
Model S3600-I having capacity 0 to 3600 inch pounds, calibrated in 100 inch pound steps.

These four models are equipped with ¾ inch drive squares.

The Sturtevant Sensory Torque Wrench permits the measurement of pre-set torque by sight, sound and feel. When the pre-set torque has been reached, the Sensory Mechanism sounds a loud and distinct click and imparts a definite strong impulse to the hand. The applied torque can also be read on the dials which are readable from all working angles.

BLUE POINT—
REVOLVING TIP LATHE CENTER

- Runs cool and yields under load to compensate for work expansion
- Same dimensions as standard solid centers
- No more messy lubrication of work centers
- No more damaged center holes in work
- Accurate quality construction throughout
- Saves time—saves money—saves work


Ball Thrust Bearing
Thrust Plate
Ball Seat Screw
Lock Screw
Tool Steel Spindle With Spring Tip
NOTE: Spindle bearing is hand-Spindle is Superfinished
Lubrication is through oil hole in Lock screw
Hardened Steel Shell
60° Point Ground Concentric To .0001"

$ 6.25

No. 2 Morse Taper Shank
No. 3—$7.75
No. 4—$9.75
Morse Taper

ASK YOUR DEALER FOR DETAILS

ERNEST H. VANDERWALL CO. 440 GOLDEN GATE AVE. SAN FRANCISCO 2, CAL.

OUR EFFICIENT TOOL DESIGNING

means
better production at a lower cost

Efficient tool designing in post-war's competitive production is a "must". Our experience guarantees you tools—designed for economy of operation, resulting in your increased production at lower costs.

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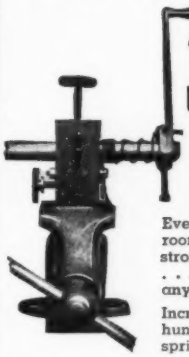
Save TIME and MONEY

WITH THE
"BLANER" Universal Hand SPRING WINDER



Every shop and tool room needs it . . . a strong, dependable unit . . . quickly set up in any vise.

Increases production of hundreds of sizes of springs. Right and left.

Write for illustrated folder, giving complete details

BLANER MFG. CO.
Corner Meek & Elm Sts.
SHARON PENNSYLVANIA

DIAMOND ACME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.

SOLENOID VALVE FOR HIGH PRESSURES

Information concerning a new small V5-100 Solenoid Valve which is said to operate at pressures up to 150 p.s.i., is given in a bulletin just issued by the Allied Control Valve Co., Inc., South Norwalk, Conn. According to the bulletin, the valve features soft seats to assure a positive seal—and all parts coming in contact with the media are of stainless steel to prevent possible oxidation or corrosion. Sectional drawings, mounting diagrams and detailed specifications are included in the bulletin which may be obtained by writing the manufacturer.

LATHE PRINCIPLES CLARIFIED

The thinking behind "Changing the Shape of Metals With an Engine Lathe," a new book just published by the Shell Oil Company is both educational and inspirational. The volume is not just another textbook for machine-tool workers. It is not intended to teach anyone how to operate a lathe. Instead, it is designed to make clear **why** the lathe operates as it does.

When a number of industrial clients asked if this reasoning could not be applied with equal effect to their industries, Shell responded by preparing "Changing the Shape of Metals with An Engine Lathe." It is designed to serve machine-tool, aircraft and automotive parts manufacturers, as well as the entire metal-working industry. Shell hopes it will not only prove valuable in itself, but will stimulate still other industries to develop comparable programs.

The book is offered to industry for use in educational activities at special quantity rates. It is also available to individuals not associated with a specific industry program at Shell's production price of seven dollars and fifty cents.

DRAFTING-BLOCK IMPROVEMENT

The Effco Products Co., of 10004 Carnegie Ave., Cleveland 6, Ohio, has announced improvements on their patented Speed-Draf drafting blocks. These blocks consist of a permanently bound block of tracing paper, with three of the most commonly used scales printed on extension flaps, one on either side, and one on the bottom, in such a way that whichever scale is needed may be folded on top ready for use. Their manufacturer says that they eliminate the need for T-squares and rulers in accurate scale work, and also that they are non-slip. The blocks are available in two sizes 8½ x 11 inches, and 8½ x 18 inches.

AIR-OPERATED COLLET INDEXING CHUCK

Redmer Air Devices Corp., of 601 W. Washington Blvd., Chicago Ill., announce the addition to their line of collet air chucks, an air operated collet indexing chuck. This indexing chuck has been in development for almost two years, and is the result of careful study among manufacturers as to the type of an indexing chuck most needed. As a result this index fixture is designed to provide ease of operations and to eliminate as much as possible errors in indexing.

It is so constructed that it is not necessary to remove the fixture from the bed of the machine in changing over to another position, as the indexing posts and numbers are located on the outside of the fixture.

While the indexing is manual, the collet is air operated, using a stationary collet in order to insure uniform depth and center of the work to be held, and has a capacity up to, and, including two inches. This fixture is adaptable to tool room use as well as production runs.

EMPIRE APPOINTS SPORR & GRANT

Empire Tool Co., Detroit, announces the appointment of F. Gordon Sporr as Secretary-Treasurer of the company. He formerly served in similar capacity for Snyder Tool & Engineering Co., and Continental Motors Corp.

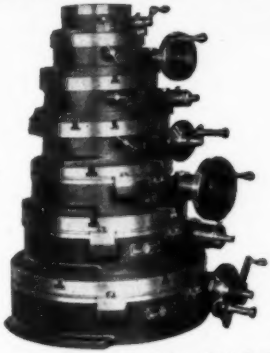
David B. Grant, has been appointed Assistant Sales Manager of Empire Tool Co., Detroit, upon his return from USNR. Before leaving for naval service he was Michigan Sales Director of that company.

CARBIDE-INSERTED COMPACTING DIE

The Jessop Steel Company, Washington, Pa., announces a new line of carbide-inserted compacting dies which are being marketed under the trade name of "Malta." At the top of the illustration is shown one of sixteen inserted carbide dies which have produced over fifty million tablets, with absolutely no sign of die wear. This production amounts to approximately 3,500,000 tablets per die, whereas, original production ran only 150,000 tablets on steel dies, using both ends. These carbide dies have never been reversed, nor have the presses been down because of wear or die failures. In addition to the above advantages, a better surface can be obtained on the tablets, with the elimination of lubricating difficulties.

Malta Carbide Dies are now being furnished in sizes from ⅛" solid drilled dies, guides, and bushings, to 36" inserted drawing dies.

TROYKE ROTARY TABLES



Sizes 9", 12", 15", 18", 21" & 25".
Ask your dealer or write us for eight page catalog.

TROYKE MFG. CO.
4422 Appleton St., Cincinnati 9, O.

QUALITY CUTTERS

The Standard of QUALITY

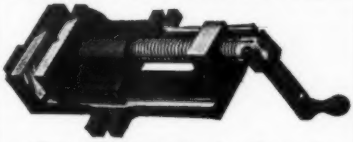
All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest *quality* and *service* at *attractive prices.*

Write today for prices. *Few Territories Open.*

QUALITY TOOL WORKS
Market St., Waukegan, Illinois

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

LEAD HAMMERS

Make them yourself!

STANDARD SINCE 1880

THE *Johnson* WAY!

Hammers now made from a special alloy that greatly prolongs their *LIFE* — Heads that will not jar off; once shapeless, can be quickly remelted, run onto duplicate handles.

Mold EASY to operate — ask for descriptive circular — write Dept. M-2

LAWRENCE H. COOK, Inc.
Successors to The Johnson Tool Co.
43 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.
TELEPHONE EA. 3681

UNIVERSAL HY-SPEED GRINDER

Grinding efficiency combined with flexibility and convenience is the claim for the new WYCO Model OO-U Universal Hy-Speed Grinder manufactured by Wyzenbeek & Staff, Inc., 838 Hubbard St., Chicago 22, Illinois.

This compact grinder can be set on a bench, hung from a hook, or suspended from the operator's belt, in case he desires complete mobility.

Three sizes are made for light, medium, and constant duty, in high speed grinding, burring, filing, sanding or polishing work from the smallest units up. Model OO-U, ¼ hp., free speed 16000 rpm.; Model OOO-U2 1/10 hp., free speed 1800 rpm.; Model OOO-U1 free speed 15000 rpm. Motors are the Universal ac-dc type with toggle switch in base and rubber cord and plug.

Model OO-U is sufficiently rugged to be used with a tool post holder for light grinding in the lathe.

"SHOCKLESS" CENTER DRILL

A combination center drill of new design promises longer life and less breakage. By including a fillet at the point where the 60° countersink angle meets the tip, the chief cause of "shock" and "fatigue" is said to be eliminated. The shock of suddenly changing the cutting angle is avoided, internal strains and stresses on the tool steel are spread over a greater area instead of being concentrated at one point or at one sharp line around the circumference of the drill at the countersink angle.

Another advantage of the fillet design is that it results in more thorough lubrication of the cutting edges. The new "SHOCKLESS" Combination Center Drill is manufactured by Reltool Corporation, Milwaukee, Wis., in a complete range of standard sizes.

DRAFTING STENCILS

"Instrumaster" is the brand of a new line of drafting Instruments of the stencil type, it was announced by Instrumaster Industries, Arch St., Greenwich, Conn. One item is intended for Isometric Drawings, the other item is for Dimetric Drawings.

Either one is precision cut out of clear high grade plastic stock .040" gauge, graduations and lettering are debossed on lower side.

It is claimed that draftsmen may make isometric or dimetric drawings by using these stencils alone without resorting to other instruments. The stencils provide inch graduations at full scale (or half scale in the case of one edge in dimetric stencils) along one vertical and two slanted edges.

EDDIE KORDENBROCK

John E. (Eddie) Kordenbrock, 72, passed away as a result of a heart ailment April 26, at his home in Cincinnati, Ohio. In 1899 he was employed as a demonstrator by the Lodge & Shipley Machine Tool Company, in which capacity he served for the next 47 years, until his death.

Mr. Kordenbrock, was buried in St. John's Cemetery, Covington, Kentucky, leaving as survivors one daughter, three sons, twelve grandchildren and two great-grandchildren.

PROTECTIVE COATING

The Geo. R. Mowat Co. of New York, N. Y., has announced a protective coating called Hytemp Klearlak which was developed to coat metal, wood, and cementitious surfaces with equal facility.

Used full strength the coating dries to .002 inch thickness but may be thinned to suit by the addition of turpentine or substitute thinner. One gallon covers approximately 650 sq. ft. on metal—less on brick or wood, and one coat is usually sufficient.

According to the manufacturer Klearlak insulates against ordinary voltage and is not affected by heat somewhat in excess of 500 degrees Fahrenheit.

INVOLUTE CHECKERS

Its improved Models 1124 and 1124-C "Sine-Line" Involute Checkers for checking the profiles on both spur and helical gears are described and pictured in a new four page technical bulletin (No. 1124-45) published by Michigan Tool Company, 7171 E. McNichols Road, Detroit 12, Mich. Model 1124 checks gears up to 12 inches in diameter; Model 1124-C will check gears up to 20 inches in diameter. Tooth spacing can be checked on both machines. Adjustments requiring less than two minutes will ready either checker for any gear within its range.

Provision has been made in the design of both machines so that the Michigan Model AY-1 Automatic Checking Recorder can be used with the involute checkers to obtain permanent recording of the findings.

A list of such special equipment as adaptors to permit the checking of internal gears; arbors for use with external gears; etc., are included in the bulletin.

CHARLES K. DAVIES & SON

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OPEN THE WAY TO GREATER PROFITS

BY USING S&S HINGES

BUTTS AND CONTINUOUS LENGTHS — *for* GUARDS — CABINETS — CASES — BOXES — LUGGAGE

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HARDWARE DIVISION

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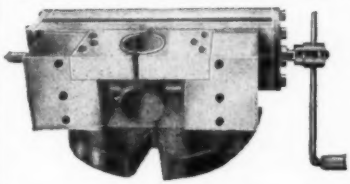
OILY FLOOR TROUBLES STOPPED with FULLERS EARTH!

An oil and grease absorbent that replaces sawdust or wood shavings. Lessens fire hazard! Stops accidents due to slipping on oil or grease! Low priced — economical — safe! Write for FREE SAMPLE or ask for trial order at quantity price!

TAMMS SILICA CO., 228 N. La Salle St., Chicago 1, Ill.

CUT TOOLING AND HANDLING COSTS —



John's Jigs and Fixtures can be adapted for a wide range of jobs, saving you money in first cost, and in handling the work, into and out of the machines. These sturdy, dependable fixtures will help you reduce production costs.

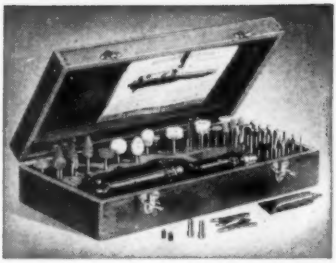
Let us send details.

HEUSER MFG. CO.

1638 N. Paulina St., Chicago, Ill.

MORE POWER LESS WEIGHT

1/6 H. P. AND 35,000 R. P. M. *UNDER LOAD*— WEIGHS 35 OZ.



Use alone or mount in stand, vise, or lathe.

Twice the power and twice the speed of any other electric handtool! Use for faster, smoother work on steel, nonferrous metals, plastics, and most other materials. Speeds up to 35,000 r.p.m. under load reduce frictional wear on mounted wheels by as much as 200%.

GRINDS MILLS DEBURRS ENGRAVES POLISHES FINISHES

Fully cased in durable, lightweight plastic and fully guaranteed shockproof without ground wire on AC or DC. For close jobs attach COOLFLEX Flexible Shaft to extend full power and speed to 9 oz. cool-running hand piece.

FACTS AND FIGURES

Send for 20 page "Facts and Figures" Booklet.

Precise Products Co.
1331 Clark Street
Racine, Wis.

THE PRECISE 35

BELLOWS DIE CUSHION

The Dayton Rogers Manufacturing Company has recently developed a pneumatic die cushion of a "bellows" type design which employs a moulded synthetic rubber bellows in place of the conventional type piston and cylinder air jack. The synthetic rubber bellows absorbs the die cushion travel of the hardened and ground pin pressure pad.

This bellows type die cushion, under test, has flexed in excess of three million cycles without any appreciable deterioration of the synthetic rubber mouldings and will stand working pressures up to 300 pounds per square inch.

The synthetic rubber moulding is not affected by oil in the air line, grease or other drawing compounds. The air leakage experienced with the conventional type equipment is eliminated due to the balloon tire bellows used in the construction and the loss of air pressure on a given unit is less than that compared with the average balloon tire. No regulating air reducing valve is necessary. The die air jack is charged from the shop air line to a predetermined pressure recorded on a pressure gauge which is furnished with each installation. Such pressure can be retained over the entire run of a given part with little or no loss in pressure.

These bellows air cushions are made in sizes from 5" to 12" having drawing capacities up to 5" and can be used very satisfactorily on all deep drawing jobs within their capacity, as well as pressure pad control on a large percentage of forming dies including ejector work, etc.

Off center loading on the hardened and ground pin pressure pad is compensated for by a heavy duty pin pressure pad guide stem which also serves as an adjustable feature. This allows the operator to stop the pin pressure pad at a predetermined height, compensating for bolster plate thickness variation and the increase or decrease in length of the pressure pad pins.

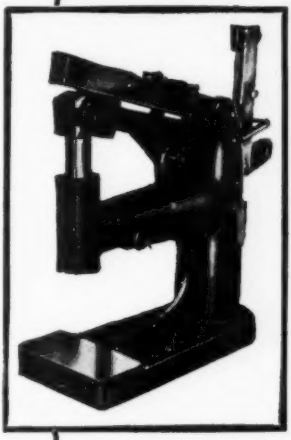
RIVETING

Speedily, Accurately Turned Out by Unskilled Labor

AUTOMATIC STAKING MACHINE

On assemblies where riveting speed and cost are an important factor, a Weber Automatic Staking Machine will do the job with more precision than any other method. Simple adjustment delivers right hammer blow for each job whether staking fixed or movable joints. Three sizes to fit any kind of job.

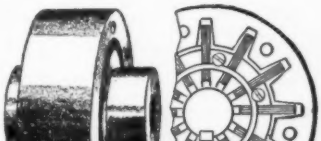
Models	1	1-B	2
Stroke	2"	2"	2½"
Spindle	1"	1"	1¼"
Throat Depth	4¾"	4¾"	8½"



WEBER MACHINE CORP.
59 Rutter St. Rochester 6, N. Y.

Each KANTILEVER COUPLING embodies five valuable features, each of which saves money for its owner. Like the ordinary Coupling it protects you against the evils of shaft misalignment but in addition develops a CUSHION TORQUE that absorbs the hammer blows of sudden loads and dampens the radial and torsional vibration that are largely responsible for the wear, fatigue and failure of your Ball Bearings, Electric Motors, Speed Reducers, Gears, etc.

No other Coupling is like the KANTI-LEVER; it has a circular series of resilient Cantilevers made of 200,000 lb. Tool-Steel laminations operating in slots, the tapered sides of which stiffen the spokes under increased loads and eliminate backlash. Radial arrangement of spokes prevents end thrust; special end play available up to four inches with no increase in Cantilever stresses; outer periphery useful as a Brake Drum for quick-stopping machinery. Send for Bulletin 28-B.



Kanti-Lever Couplings

4,000,000 H. P. IN USE

BROWN ENGINEERING CO.
126 NORTH 3RD ST. READING, PENNA.

TIME-SAVING MACHINE TOOLS SINCE 1901

Moline Tool Company since 1901 has been designing and building machine tools of the highest degree of efficiency for these operations:

- Boring—rough, semi-finish and finish
- Honing
- Milling—(special machines)
- Straight Line Drillers
- Universal adjustable spindle drillers
- Way Type Machines—horizontal and vertical drilling, tapping and boring machines

"Hole Hog" machine tools are versatile—their construction makes possible easy change-over to other jobs. They are easy to operate and are ruggedly built for years of continuous production service. For man-hour savings—for more efficient, smoother work—look to Moline machines.

Write for information concerning machine tool equipment for your special problems.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY

108 20th Street **MOLINE, ILLINOIS**

economical movement of materials, led to progressive increase in power. Now after World War II, trucks of ten tons capacity are available for general use.

A number of these 10-ton units has been built by the Elwell - Parker Electric Co., Cleveland, for government work, including the Manhattan project. Government and its contractors used all types of industrial trucks, including low and high- lift platforms, forks, cranes and tractors, for innumerable jobs in all parts of the country, while the Army and Navy scored remarkable records in transporting materiel with the same types. Capacities of the majority of these machines ranged from 2 to 5 tons.

TEN-TON INDUSTRIAL TRUCK

Capacities of power industrial trucks in general use have increased substantially after each global war due to intensified experience with them. They were in early development at the outset of the first conflict; the best then could lift and carry 2 net tons. As that war progressed 3-ton trucks were built; after it was over more trucks were required, with capacity for transporting loads weighing 5 tons.

Economies apparent in handling larger tonnages at one time, the "secret" of fast,

The new 10 ton trucks are driven by means of storage batteries and electric motors. Their most notable features aside from compactness and power, are simplicity, instant responsiveness, ease in maneuvering; smooth, quiet operation, safety and economy.

The body of the truck is low and the operator has complete visibility of platform, load and surroundings. Overall length is 147 inches, width 45 inches. It is steered by means of all six of its wheels. Four of these wheels, under the platform, insures stability of the load. It can turn in aisles 71 inches wide

Save Time WITH
NICHOLSON EXPANDING MANDRELS

SET OF 19 DOES THE WORK OF 209 SOLID ARBORS

Nicholson expanding mandrels cut costs 2 ways: first, by saving the time lost in making or looking for solid arbors; second, by promoting precision. Hardened tool steel, accurately ground. Two types. Sold singly or in sets. Bulletin 1043.

W. H. NICHOLSON & CO.
117 Oregon St., Wilkes-Barre, Pa.

TYPE A—STEP JAW DESIGN

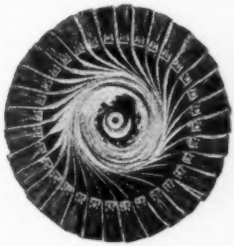
Size No.	Range of Bores Taken	Length Overall
1A	½" to 1"	9"
2A	1" to 1½"	11"
3A	1½" to 2"	12½"
4A	2" to 3"	20½"
5A	3" to 4"	21"

TYPE B—STRAIGHT JAW DESIGN

Size No.	Range of Bores Taken	Length Overall
1X	½" to 13/32"	5"
2X	13/32" to 21/32"	6"
3X	21/32" to 35/64"	6"
00	3/4" to 7/8"	8¼"
0	7/8" to 1"	8¼"
1	1" to 1¼"	9"
2	1¼" to 1 13/16"	11¾"
3	1 13/16" to 2"	13¾"
4	2" to 2½"	17¼"

(Other sizes taking up to 7" bores.)

TO HIT A NEW HIGH



To hit a new high in adaptability and to gain a smooth performance in every operation in the metal working industry, try the Vonnegut Brush-Backed Abrasive Head.

For every metal-finishing process, there is a correct grade and grit of abrasive-coated cloth to be used in this Vonnegut Head which will effectively reach all surfaces of irregularly shaped patterns. With its clean cutting action, it can be adapted to any job.

Write today for further details to:

VONNEGUT MOULDER CORP.
1805 Madison Avenue • Indianapolis, Indiana

McGILL SOLIDEND MULTIROL BEARING
INNER RACE ASSEMBLY
This new McGill Inner Race and Roller Assembly is similar in design to our well known Solidend Multirol Bearing. It is a self-contained unit . . . the rollers cannot drop out. Small radial space is required, and great load-carrying capacity is obtained. Typical application is the constant mesh gears in transmissions. Ask for Bulletin No. IR-45.
McGILL MANUFACTURING CO., INC., VALPARAISO, IND.
MANUFACTURERS OF BALL AND ROLLER BEARINGS

POWDER-WELD BULLETIN

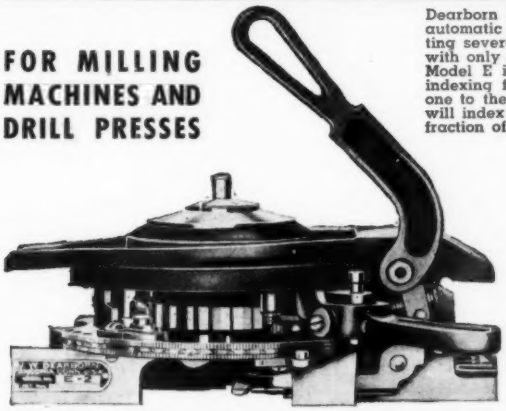
Another welding or metal or plastic surfacing process is indicated by a new flame tool recently announced by the Powder Weld Company, 419 Kent Ave., Brooklyn, N. Y. The equipment consists of a torch, made in the general outlines of an ordinary welding torch, but having a special patented nozzle and sixteen independent controls, many of them at the handle of the tool; a control box with air and gas pressure regulating valves and a canister from which powdered materials are fed through the flame. The flame is generated and controlled by pre-selected combinations of gasses and air.

Known as Powder Weld, the equipment is described in a bulletin issued by the maker as "a new method of welding, brazing or surfacing with infinite compositions of powdered materials." Many varieties of superhard metals can be successfully applied with speed and to a depth of coating possible in a hard facing. Various types of plastics also can be applied. The latter fields of use were described by the inventor, R. A. Wiese, head of Powder Weld, as being the ones in which the equipment is finding greatest immediate application. Welding applications are restricted only by limitation in the variety of powdered metals now available which are suitable for welding.

Outstanding feature of the equipment is the completeness of control over all operating conditions, enabling operator to achieve the following results: Precise control of the amount of flux to be used with the metal or alloy. Mixture is predetermined and accurately weighed before use; Accurate control of the amount of the mixture used, per minute or per inch of weld or braze. This control is right at the operator's finger tip: Accurate control (at the torch handle) of the flame temperature and atmosphere, by regulating the amount of fuel gas-oxygen mixture and the addition of processing gas around the flame as desired. The cooling of processing gas is controlled independently of the fuel and of the projecting gas.

THE NEW DEARBORN MODEL "E" CHUCKING AND INDEXING FIXTURES

FOR MILLING MACHINES AND DRILL PRESSES



Dearborn fixtures meet every demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting.

Model E is both a degree and a ratchet indexing fixture. It may be changed from one to the other in less than a minute. It will index any number of degrees or any fraction of a degree. Two adjustable stops are provided so that two angles can be obtained if necessary.

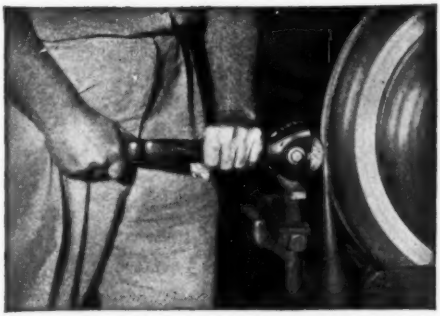
Work is held by collets which take up to and including 1" round, 7/8" hexagon and 3/4" square. Other shapes can be held with special collets.

Let us send bulletin giving full information.

J. W. DEARBORN

ANSONIA, CONN., U. S. A.

DESMOND GRINDING WHEEL DRESSERS



Correct method of using Huntington Dresser.

You can increase your grinding production by dressing your wheels regularly with Desmond Dressers.

We manufacture the only complete line of dressers and will be glad to send any of them to you for trial or advise the type and size you should use.

Write today for a copy of our catalog "H" and name of your nearest dealer.

THE DESMOND-STEPHAN MFG. CO.
URBANA • OHIO

ANNOUNCING!

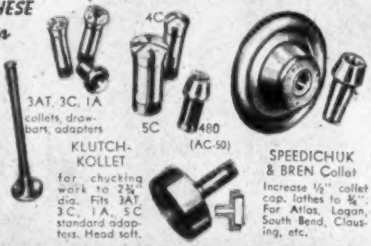
THE NEW Precision LINE OF COLLETS AND FEED FINGERS FOR BROWN & SHARPE MACHINES

IMMEDIATE DELIVERY FROM STOCK

The addition to the *Precision* line of collets and feed fingers designed for use in Brown & Sharpe machines gives you a dependable source for speedy delivery . . . And as always, the *Precision* name on these new collets and fingers is your unconditional guarantee of selected steels, uniformity in machining, grinding and heat treating. You will like their lasting spring quality and hair-trigger accuracy.

DO YOU KNOW THESE OTHER Precision PRODUCTS . . .

Precision lathe collets fit many machines and attachments including 10" Atlas, Logan, Craftsman, Powr-Kraft, South Bend, Clausing, Sheldon, Hardinge, Elgin, Dalton, Schauer, Sebastian, etc.



KLUTCH-KOLLET for chucking work to 2¾ dia. Fits 3AT, 3C, 1A, 5C standard adapters. Head soft.

SPEEDICHUK & BREN Collet Increase ½" collet cap. lathes to ¾". For Atlas, Logan, South Bend, Clausing, etc.

KASSON GENERAL DIE AND STAMPING COMPANY
PRECISION COLLET DIV., 268 Mott Street, New York 12

It pays to specify *Precision* when collet work is indicated, because you get the best, and you get it promptly from stock. Order from your Industrial Supply Distributor. . . He is ready to serve you. *Literature is available. Why not write for it today.*

SINGLE SPINDLE SCREW MACHINES

Independent control of twelve individual working tools permits carbide tooling in the Tavannes automatic, which is marketed by Commentry Industries, Inc., 260 West Broadway, New York 13, New York.

Available working positions are divided into six stations for side slide operations, and six turret positions. Each of the six turret tools can be rotated independently of the other, when a turret unit containing six revolving spindles is in use.

As the guide bushing is located very close to the point of cutting action, unusually long work can be machined effectively without the use of separate stock rests. Close size tolerances can also be held, as the work is constantly supported at the point of maximum cutting pressure. Turning - behind-shoulder work and generation of complex shapes are also simplified by this method of turning.

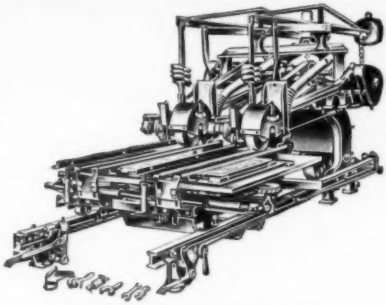
Tavannes single spindle screw machines are built in two capacities; the M-40 machine accepting bars up to $1\frac{5}{8}$ inch diameter, and the M-60 which handles $2\frac{3}{8}$ inch diameter bar stock. Weight of each model is 5500 lbs.

Two prism-shaped vee ways, centered in the same horizontal plane as the axis of the headstock live spindle, guide the headstock as it feeds the bar stock past the cutting tools.

Double row roller bearings support the live spindle at the front — a double row ball bearing being used to support the spindle at rear.

Two relatively large side slides which are set vertically with respect to work location, are positioned close to the stock guide bushing to obtain maximum support for the work during cutting action. Side slide tools are moved into working position by cams on the camshaft located at the rear of the automatic, and a series of levers connecting them to the slides.

Drilling, reaming, counterboring and recessing are some of the operations which can be done with carbide tools, without respect to hole size or limiting factors of the other working tools.



EXCELSIOR No. 27

AUTOMATIC

GRINDING and POLISHING

MACHINE

HERE IS A

Machine

FOR

GRINDING and POLISHING

Stove Tops

Auto Bumpers

Electric Irons

Stainless Steel Sheets

AND

Other Products

EXCELSIOR TOOL & MACHINE CO., EAST ST. LOUIS, ILLINOIS

ATLANTIC

. . . can handle your gear job

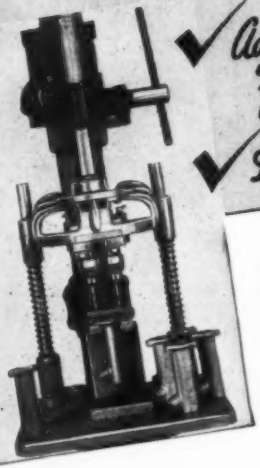
Whether it's a simple spur gear or a complicated herringbone or worm . . . whether it's a single gear or a quantity proposition . . . whether it's ¼ in. or 5 ft. pitch diameter. If it's a gear Atlantic can make it, quickly and well.

We are fully equipped for prompt service on special gears and breakdown jobs. Send us blueprints or gear samples for our quotations and delivery dates.

ATLANTIC GEAR WORKS

200-A LAFAYETTE ST.
NEW YORK 12, N. Y.
Phone: CAnal 6-1440

TWO SPINDLE
Adjustable
DRILL HEADS
Drill Two Holes At Once



✓ *Adjustable Centers from ½" to 6"*

✓ *Drill Capacity 0" to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

LINDERME MACHINE & TOOL CO., INC.

12253 Coyle Ave., Detroit 27, Mich.

INJECTION MOLDING MACHINE

The recent announcement of a 32 ounce Lester Injection Molding Machine for making larger plastic moldings extends the scope of the new Lester-Phoenix Line to include capacities of 6, 8, 12, 16, 24 and 32 ounces, all of which are now being manufactured.

Several new features have been introduced in the new models, all of which are basic improvements over existing equipment. These include:

A Superior Injection System: The vertical heating cylinder in the new models has a solid plunger delivering the material over an internally heated, streamlined torpedo which serves as the primary heating element in addition to the usual set of three external resistance type heaters. Resistance to flow is minimized in the vertical injection system, which is said to deliver more material into the mold at higher pressure with a given energy input. The entire injection system can be swung out quickly for inspection, cleaning and replacements.

Rigid Frame: A one piece, box-type, cast alloy steel frame makes possible the elimination of all joints, and provides greatest possible rigidity and strength.

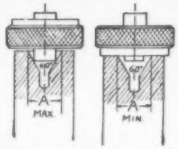
Metal - to - Metal Mold Locking: The newly designed toggle linkage, with the mold positively supported at all four corners, speeds mold opening and closing. When closed, the "shock" load of injection is carried by four metal-to-metal supports through spiral or roller contact of hardened cams on the toggle links with hardened cam locks on the frame in direct alignment with the beams. Flash is eliminated, die space is increased and die movement restricted.

Larger Mold Adjusting Screw: The movable platen is supported by a greatly enlarged mold height adjusting screw both at the center and at the outer perimeter.

Full details and data for the new Lester Injection Molding Machines may be obtained by writing to Lester-Phoenix, Inc., 2711 Church Avenue, Cleveland 13.

MASSEY MACHINE

Gages & Fixtures

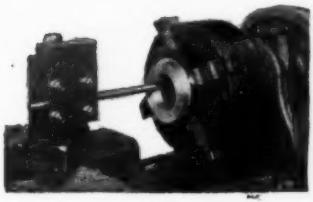


Center Depth Gages for precision see and feel control of shaft center depths

Adjustable Go—No Go Snap, Depth & Width Gages

Small Positioner for Inspection, Assembling, Soldering

Hardened & Ground Close Tolerance Collars 32 Standard Sizes for shaft collars and tool stops



Adjustable Height Heavy Duty Boring Bar Holder

Write for Bulletins
Territory Open for Dealers

MASSEY MACHINE COMPANY

Inc. 1903

777 Pearl Street — Watertown, N. Y.

SPRING PRESSES

Send for circular

Power and Foot Operated...

TAYLOR & FENN Spring Presses are used for Riveting, Staking, Stamping and similar operations on small, light parts. They are constructed to compensate for variation in thickness of the work and to deliver repeatedly a UNIFORM BLOW.

M-110 (illustrated) powered by a small reducer with a one-sixth H. P. motor, is designed to eliminate the fatigue factor inherent in foot operated Presses. A similar Press, M-120, of the same size and capacity is equipped to operate by compressed air.

OTHER MACHINES MANUFACTURED:

Vertical Millers
Duplex Spline Millers
Medium Duty and High Speed Sensitive Drilling Machines

THE TAYLOR & FENN CO.

HARTFORD, CONN. U. S. A.

Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

American
DIAMOND TOOL & GAUGE CO.
15920 WOODINGHAM • DETROIT 21, MICH.

HAND OPERATED SURFACE GRINDER

The new No. 2, hand operated drive grinding surface grinder, has been developed by Parker-Majestic Inc., 147 Jos. Campau St., Detroit, Michigan, makers of the popular Parker grinding spindle. The trend in modern machining operation is toward increased complication and higher precision, which in turn, demands more apt tooling.

The work table, all ways, and working surfaces are hand scraped to give precision bearing and minute pockets for the necessary surface oiling. In addition, antifriction radial and end thrust bearing construction assures positive smooth operation where it is most needed. Operation levers are within easy reach. Working surfaces and open parts which might be impaired by abrasive dust are properly protected.

Simple in design, the No. 2 offers increased rigidity at all important points.

An important feature is the calibrating of the vertical travel hand wheel which reads in tenths and suitable means are incorporated to assure correct readings. The hand wheel projects at the proper angle and is located at the correct height for easy adjustment. Spindle rise is from zero to a full 13" from table top to spindle center-line.

The multiple speed unit has been designed to provide the required spindle speed changes when using larger or smaller diameter or various bonded grinding wheels. Seven speeds are available, ranging from 2160 rpm. to 6000 rpm. inclusive, by simple "pick-off" pulley changes. This range accommodates grinding wheel diameters from 2" to 10".

Many precision tools, dyes, and fixtures of a cylindrical nature, being ground between centers, can be locked into position for longitudinal grinding. Splines, serrations and flutes are a few examples. Accordingly a method is provided for clamping the crossfeed saddle quickly and securely at any desired spot. The method used avoids any possible distortion of the saddle, yet permits accurate and positive locking.

★ THE ★ WONDER CUTTER

The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely.

Hand operated. A giant for work, cuts wire and rods up to 5/8-in. round or 3/8-in. square and band iron up to 1/8 in. by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices.

The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio

KEYWAYS IN QUANTITIES *10 Times Faster*

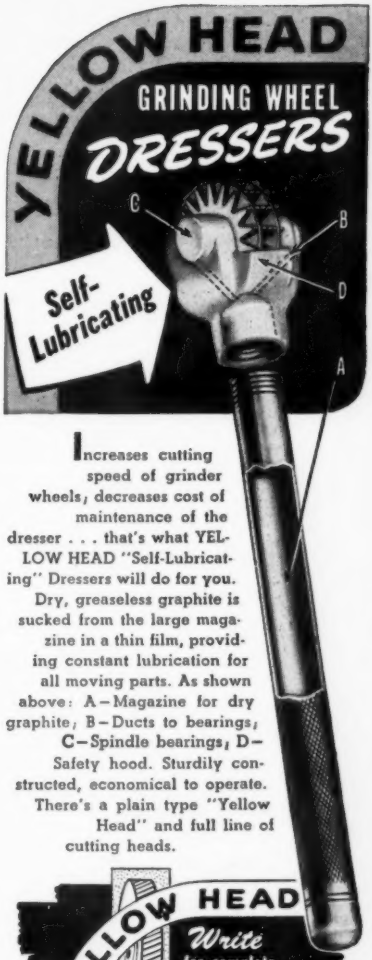
WITH THE **GLENNY....** adjustable-expansion *Push* **BROACH**

Accuracy of ± .0005

Send for Bulletin 9

Dept. A
East Shore Mach. Prod. Co.
835 East 140th Street - Cleveland 10, Ohio, U.S.A.

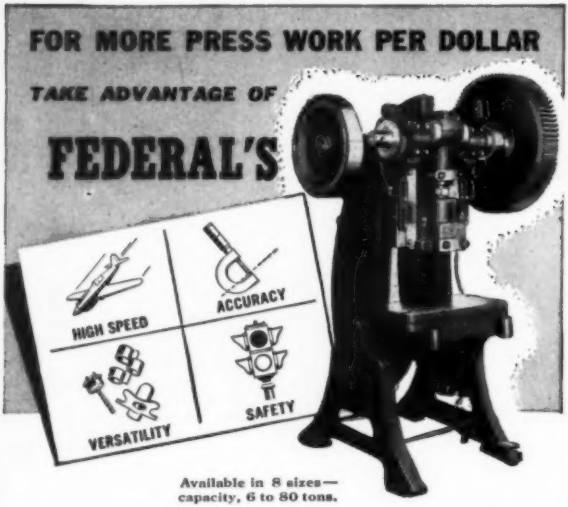
YELLOW HEAD GRINDING WHEEL *DRESSERS*



Increases cutting speed of grinder wheels, decreases cost of maintenance of the dresser . . . that's what YELLOW HEAD "Self-Lubricating" Dressers will do for you. Dry, greaseless graphite is sucked from the large magazine in a thin film, providing constant lubrication for all moving parts. As shown above: A—Magazine for dry graphite; B—Ducts to bearings; C—Spindle bearings; D—Safety hood. Sturdily constructed, economical to operate. There's a plain type "Yellow Head" and full line of cutting heads.

YELLOW HEAD *Write* for complete details and prices

CITY MACHINE COMPANY
Piqua, Ohio



Available in 8 sizes—capacity, 6 to 80 tons.

● If you're looking for a way to offset increasing labor rates and meet the demand for lower production costs, take advantage of the many Federal features that assure more press work, finer press work, a wider variety of press work per dollar—safely! Write today for latest catalog on the complete Federal Press Line.

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THREE-WAY SHOCK ABSORPTION

A new type of anti-vibration mounting unit, for the protection of delicate equipment of all kinds, is now in production and available for many industrial applications, C. S. Robinson, president of Robinson Aviation, Inc., has announced.

"This mount, the Robinson Vibrashock unit, is remarkably effective and, it is believed, offers for the first time a complete vibration absorption unit ready for installation and use," Mr. Robinson said. "A damping system, a snubbing system and electrical bonding are integral and are contained in a neat aluminum housing of standard dimensions."

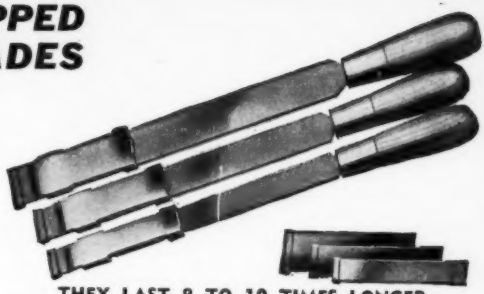
Robinson's wartime experience in developing specially designed suspensions for shock-mounting delicate airborne radar, ordnance, communication and photographic equipment for the armed services disclosed that no standardized mount in use effectively absorbed vibration in more than one direction. The new Vibrashock Unit mount was designed to fill this need, in a convenient and inexpensive form.

Actual performance tests have shown that the new Vibrashock Unit averages better than 90 per cent absorption of vertical and lateral vibrations over a wide range of frequencies. Experience has shown that this high absorption results in tremendously increased service life and notably lower maintenance costs.

Vibrashock units, manufactured by Robinson Aviation, Inc., of Teterboro, New Jersey, are available in three standard sizes and a wide range of load capacities to provide efficient, economical anti-vibration mounting and lengthened service life for: presses, automotive machines, compressors, motors, generators, sewing machines, fans, blowers, counting and sorting machines, soundproofing walls and ceilings, and many other installations.

CARBOLOY TIPPED SCRAPER BLADES

Available in three widths to fit the Anderson standard line of hand scrapers. Simply remove the high-speed steel blade and slip in the Anderson Carboloy Tipped Blade.



THEY LAST 8 TO 10 TIMES LONGER

If you are already using Anderson Hand Scrapers it is not necessary to buy complete new scrapers in order to use carboloy tipped blades.

Speed up your scraping operations with these more efficient, longer lasting blades. They are especially good for the new hard alloy iron and the extremely hard bronze castings used in war equipment.

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ANDERSON BROS. MFG. CO.
Anderson
ROCKFORD, ILL. U.S.A.

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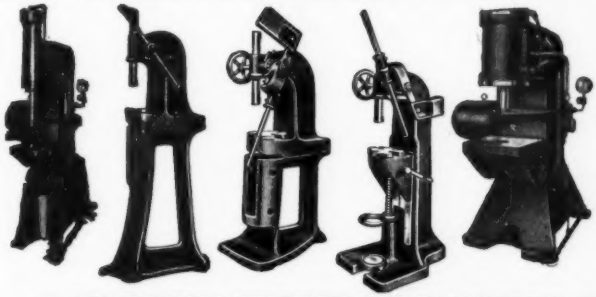

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Wick Feed Oiling is the cleanest method of lubrication you can get—no foreign matter or dirt can be transmitted through the wick to the bearing. It can be varied to supply just the right amount of not-too-heavy oil at any one of several locations on each bearing whether it be vertical or angular position; high, low or intermitted in speed. Gits Wick Feed Oilers are available in a wide range of styles, sizes and materials. Ask for complete information on this type of oiler.

Gits Catalog No. 60 gives you 172 pages of Oiler, Oil Seal and Lubricating Device information. . . . Write for it.

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FOG-FREE GOGGLE

Although this new Fog-Free Goggle has been widely accepted by industries already recognizing the principle of impact protection, other very recent applications demonstrate that eye safety can mean more than accepted ideas of protection.

Recently in the chemical industry, and in industrial plants where corrosive acids and alkalies form a decided hazard, the Fog-Free has come into use for splash protection and to ensure clear vision through the non-fogging principle of the goggle. A wide area around the eyes is covered and protected by the Fog-Free. Where furnaces and boilers must be entered for cleaning, inspection or repair, this goggle prevents soot, dust and perspiration from obscuring vision, and to a considerable extent prevents inhalation of dust. Even on midwestern farms the three-way protection of the Fog-Free Goggle is serving the cause of eye safety.

The Fog-Free Goggle is in no sense a respirator although the nose is covered, but much dust is filtered out by the pads in the intake ports. Normal breathing provides a complete change of air in the lens chamber about once every second. This air sweeps away all moisture entering the chamber from around the eyes, before it can condense and fog the inner surface of the lens.

The large, plastic Polaroid Non-Polarizing lens provides wide, unobstructed vision and is non-shatterable. It exceeds Federal break test requirements.

Since the Welsh Manufacturing Company of Providence, Rhode Island launched the Fog-Free Goggle, various refinements have increased its effectiveness. An easily attached and removable tinted lens is now available to provide glare protection. It also increases impact resistance. The interior design has also been modified. This ensures better fit around the nose and greater comfort for the wearer. We suggest you contact the company if you have any "sight-problem" peculiar to your business.

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★ GUARANTEED

YES...

Guaranteed like all Murphy products, to do the job . . . and wear Guaranteed to eliminate entirely all moisture from compressed air lines which have heretofore proved stubborn. Entirely mechanical and automatic. No absorbents . . . no chemicals. Install it and forget it.

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SPRAY GUNS • PISTOL SPRAYERS

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Moisture Elimination Up To 3000 Pounds Per Square Inch

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5 TON
INCLINABLE
POWER PRESS
•
ACCURATE
DURABLE
•

WEIGHT ...520 lbs.

CRANKSHAFT, dia. main brgs. ....1⅝" at C.S. brgs. ..1¾"

RAM stand stke...1" maximum stke. ..2" (to order extra ch'ge)

OVERHANG, center of slide to frame 3½"

BED, area bolster plate .....12x7" Size of opening through back ....7"

MOTOR required, ½ HP 1200 RPM

For Further Details Write

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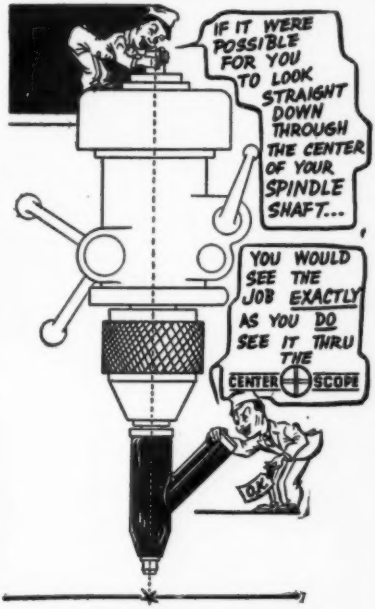
UNQUESTIONED ACCURACY


IF IT WERE POSSIBLE FOR YOU TO LOOK STRAIGHT DOWN THROUGH THE CENTER OF YOUR SPINDLE SHAFT...
YOU WOULD SEE THE JOB EXACTLY AS YOU DO SEE IT THRU THE CENTER SCOPE
OK

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Plus or minus one ten thousandth.

CENTER SCOPES ARE FAST
Line-up your layout in 30 seconds.

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ANYONE can use them.

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at 50,000 R.P.M.
You get two important advantages when you use this Onsrud MD-1 Air Turbine Grinder on precision work. (1) Its power and speed give ¼" to ½" wheels the surface speeds at which they cut most smoothly and effectively. (2) Absence of noise, heat and vibration make the MD-1 easy and comfortable to use.
For a valuable addition to your data file on better, faster methods and tools, send for special Onsrud Portable Grinder Bulletin. Write today.
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AIR TURBINE and HIGH CYCLE TOOLS and MACHINES
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MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION
CHICAGO

SHEET METAL CRIMPER

An ingenious device with which sheet metal up to 16-gauge may be crimped either at the bench, on the job or after installation, has been perfected by Frank Lucarelli, Tool Designer of The Glenn L. Martin Company, Baltimore, Maryland.

The tool will work equally well on straight edged metal, sheets or pieces curved to any shape, on the inside of blanked-out holes or wherever crimping on sheet metal may be required.

In its general shape, it is not unlike the familiar can opener attached to the kitchen wall or a tool used by shoemakers to crimp pieces of leather together. Two round dies, one with a projecting edge, the other rounded to fit, are held together by spring tension and an adjustable screw to fit them for various thicknesses of metal.

Turning a crank pulls the metal sheet between the dies. Held firmly against a guide, the edge of the metal is crimped to the desired shape. But little physical strength is required for the operation, certainly no more than to open a can of food in the kitchen, and the time saved is at least half as compared with any other hand tool which would perform the same job.

The tool may be operated by clamping it in a bench vise, probably its most widely used place. By substituting a wheel for the conventional handle (with little sacrifice in leverage) it also can be used right on the piece needing crimping after it has been installed in the airplane, or a new crimp can be put into a piece of sheet metal without having to completely remove it.

Ratchet wheels may be installed in the device so that there is no slipping, because, being small and handling only the thinner sheets of metal, the gears will not unmesh sufficiently to separate.

One of the most important factors is that of safety, when compared with previous methods of hand crimping. Most of these required a tool looking somewhat like an oversize pair of pliers which was literally pulled around the edge.

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ZEISS
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HEADBAND MAGNIFIER
2¼x

Use of both eyes reveals true depth of details. Magnification of 2¼x. Free working distance, about 8", permitting unhindered use of hands. By just lifting your head, your eyes are free for any other activity. Eyeglasses may be worn while using. Highest optical quality. Eyeshade of Tenite—practically unbreakable.

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Direct Current Motor

We are also manufacturers of A.C. generators, 500 watts to 125 K.W., rotary converters, motor generators, high frequency generators, etc.

Katolight engineers have developed a lot of know-how. Give us a chance on your special requirements.

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LEACH External Grinder

$875.00

Fully Equipped

Grinds work from ¾" to 11" in length and from ⅛" to 7" in diameter.

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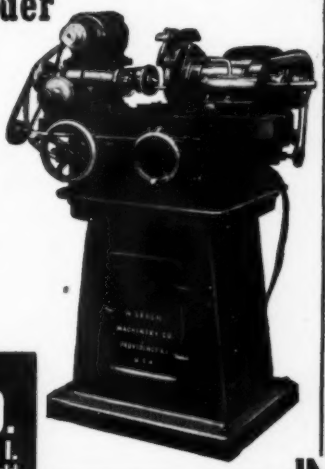

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TOOLS THAT SIMPLIFY CHANGES

It is often necessary to modify boring bars and cutters rather than the machine when changes are made in the design of machined parts. Special boring units, turret lathes, horizontal boring machines and similar machine tools are readily adapted to specific work when correctly designed boring bars are used. Production engineers have found it both possible and practical to use machines on hand to perform work which has been changed in design. By taking full advantage of various standard and special boring bars and cutters, machinery inventory need not be increased because of production changes.

Davis plain and block type line boring bars are made in a wide range of designs for many individual needs. Soft bars may be obtained for occasional boring jobs where production does not warrant more expensive bars. Heat treated bars can be furnished for boring operations where cutting loads are heavy and a bar with high physical properties is needed. Carburized and hardened bars are recommended for those boring operations which require resistance to wear for high production.

When unusual or complex boring operations must be accomplished on other type horizontal boring equipment, it is often possible to use specially designed boring bars for this purpose. Such bars may be equipped with expanding and retracting type cutters, depending upon the operation. One of the most important uses for such bars and cutters is for boring large engine blocks.

Multiple boring cuts may be performed simultaneously by using Davis stub boring bars equipped with expanding block cutters. Davis boring bars and cutter blocks are precision made.

ATTENTION TOOLMAKERS

BORING CHUCK . . . $12.50

⅜" ADJUSTABLE IN THOUSANDTHS
. . . ⅜" TOOL DIAMETER

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30 YEARS EXPERIENCE

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THROATLESS BENCH SHEAR

CAPACITY — 3/16"

BLADE LENGTH — 5"

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at . . . Lower Costs!

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CENTERLESS FEED
POLISHING MACHINE

Gives any grade of finish to cylindrical work. Polishing wheel mount is heavy, with triple V-belt drive. Wheels can be trued in motion. Feeding speed is variable, the work support being adjustable with the feed unit. All parts are guarded but accessible. Construction is rigid and durable.

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Use artificial or natural gas or gasoline. Start without generating —"soldering heat in less than a minute." Schmidt "CONCEALED FLAME" Soldering Torches hold coppers steadily at any desired heat for continuous work. Very economical.

A moderate investment in Schmidt Equipment will step up production, reduce costs and increase profits. Send for circular.

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Brazing
Branding
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Use, etc.

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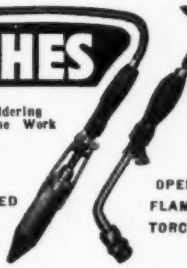
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VICTOR'S BARGAINS IN TUNGSTEN CARBIDE TIPPED TOOLS

Price $.90 Each In Any Size

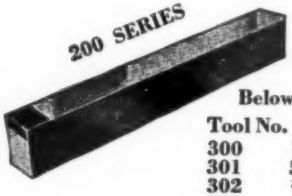
New Low Prices — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.

Left — 100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½



Right — 200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below — 300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

STANDARD TUNGSTEN CARBIDE TIPPED TOOL BITS

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lot of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

We Carry Silicon Carbide Emery Wheels for Grinding Tungsten Carbide Tool Bits

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Diameter Inches	Face Inches	Hole Inches	Our Net Price Each
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2	¼	5/8	2.77
2	3/8	5/8	3.02
2½	¼	7/8	3.40
2½	5/16	7/8	3.59
2½	3/8	7/8	3.78
2½	7/16	7/8	4.15
2½	½	7/8	4.15
3	3/16	1	4.10
3	¼	1	4.10
3	5/16	1	4.35
3	3/8	1	4.54
3	7/16	1	4.79
3	½	1	5.04
4	3/16	1	5.67
4	¼	1	5.67
4	5/16	1	6.36
4	3/8	1	6.36
4	7/16	1	7.12
4	½	1	7.12
4	9/16	1	7.75
4	5/8	1	7.75
4	¾	1	8.38
4	7/8	1	10.00
5	3/16	1	10.00
5	¼	1	10.00
5	5/16	1	$10.00
5	3/8	1	10.00
5	7/16	1	10.00
5	½	1	9.51
5	5/8	1	10.52
5	¾	1	11.46
5	7/8	1	13.42
5	1	1	13.42
6	3/16	1	12.50
6	¼	1	12.50
6	5/16	1	12.50
6	3/8	1	12.50
6	7/16	1	12.50
6	½	1	12.41
6	5/8	1	13.92
6	¾	1 or 1¼	15.12
6	7/8	1 or 1¼	17.89
6	1	1 or 1¼	17.89
7	½	1 or 1¼	18.00
7	5/8	1 or 1¼	18.00
7	¾	1 or 1¼	21.67
7	1	1 or 1¼	25.39
8	½	1 or 1¼	25.00
8	5/8	1 or 1¼	25.00
8	¾	1 or 1¼	28.00
8	1	1 or 1¼	33.64

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HIGH SPEED STEEL, STRAIGHT SHANK

TWIST DRILLS

EXTRA LENGTH

9" CUTTING FLUTES — 12" LONG DRILLS

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
1/8"	12	9	$1.50	21/64"	12	9	$2.25
9/64"	12	9	1.50	11/32"	12	9	2.25
5/32"	12	9	1.50	23/64"	12	9	2.50
11/64"	12	9	1.50	3/8"	12	9	2.50
3/16"	12	9	1.50	25/64"	12	9	2.75
13/64"	12	9	1.60	13/32"	12	9	2.75
7/32"	12	9	1.60	27/64"	12	9	3.00
15/64"	12	9	1.75	7/16"	12	9	3.00
1/4"	12	9	1.75	29/64"	12	9	3.25
17/64"	12	9	1.85	15/32"	12	9	3.25
9/32"	12	9	1.85	31/64"	12	9	3.25
19/64"	12	9	2.00	1/2"	12	9	3.25
5/16"	12	9	2.00				

HIGH SPEED STEEL, TAPER SHANK

TWIST DRILLS

EXTRA LENGTH

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
17/32"	15	12	$6.50	27/32"	15	12	$11.50
9/16"	15	12	7.00	7/8"	15	12	12.00
19/32"	15	12	7.50	29/32"	15	12	12.50
5/8"	15	12	8.00	15/16"	15	12	13.00
21/32"	15	12	8.00	31/32"	15	12	14.00
11/16"	15	12	8.25	1"	20	15	16.00
23/32"	15	12	8.50	1-1/16"	20	15	17.00
3/4"	15	12	8.50	1-1/8"	20	15	18.00
25/32"	15	12	9.50	1-3/16"	20	15	20.00
13/16"	15	12	11.00	1-1/4"	20	15	22.00

Victor Machinery Exchange

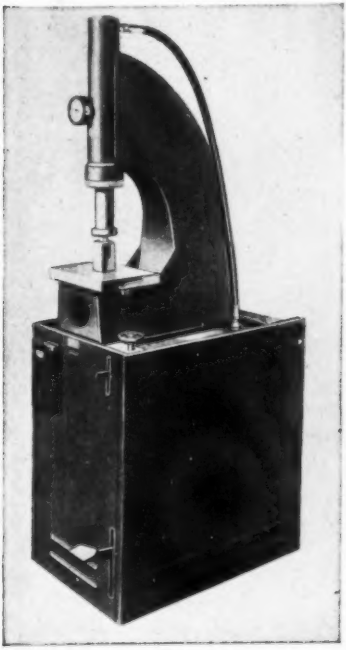
INC.

251 CENTRE STREET **NEW YORK 13, N. Y.**

PHONE: CAnal 6-5575

HYDRAULIC PRESS

A line of positive, self-contained hydraulic presses, adaptable to all sizes and types of shops has recently been brought out by the Munton Mfg. Co., Franklin Park, Illinois.



Available with self-contained motor drive for production work, foot operated, either mounted with bottom of press open or flush as illustrated.

They are available in capacities of 4½-7-10-15-20 and 25 tons, with means to limit pressures as low as required. Pressure gauges help determine pressures being applied, such as in laboratories, testing, etc. A holding valve may be ordered as an extra, enabling press to be used for certain molding or glue weld operation which causes ram to be held under pressure until lever is tripped.

Some people have a good aim, but never pull the trigger.

RED-E-TOOLS
SAVE MONEY
SPEED PRODUCTION
SAFEGUARD PRECISION
THERE'S A DIFFERENCE HERE
RED-E
HIGH SPEED CENTERS
Outlast and outperform ordinary centers many times over.
Examine this Red-E High Speed Center carefully Note the generous proportion of High Speed Steel . . .full diameter and with ample extra metal for many regrinding operations. High speed tip is electric butt flush welded to chrome steel shanks to give you a top quality tool throughout with extra service value built right in. Top quality centers are a small but mighty important investment. Write today for Red-E High Speed Center Bulletin No. B - 46
THE READY TOOL COMPANY
IRANISTAN & R. R. AVENUES
BRIDGEPORT, CONNECTICUT
OTHER RED-E PRODUCTS YOU SHOULD KNOW...
CEMENTED CARBIDE TIPPED LATHE & GRINDER CENTERS with the RED-E Safety "Life" Joint
HIGH SPEED STEEL CENTERS
RED-E HEM REPARTURE BALL BEARING CENTERS
RED-E STYLE K LATHE TOOL with the Tool Steel Bearing
MILLING MACHINE & FACE PLATE DOGS
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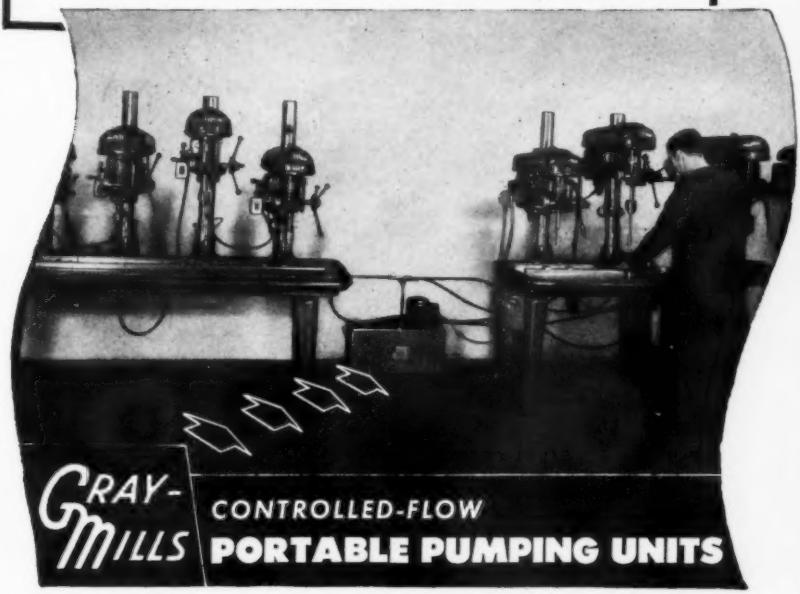
RED-E TOOLS

Mechanics Through the Ages

AS LATE AS THE MID-1800'S EUROPEAN RUSTICS BELIEVED THAT DYSENTARY COULD BE CURED BY DRINKING WATER IN WHICH THE BLACKSMITH HAD QUENCHED THE WHITE HOT IRON HE WAS WORKING WITH!
AMERICA'S FIRST CIRCULAR SAW WAS MADE IN 1814 BY BENJAMIN CUMMINS AT BENTONVILLE, N.Y., WITH BLACKSMITH TOOLS!
DURING THE REIGN OF QUEEN ELIZABETH OF ENGLAND, LOCKS PROVIDED WITH BELLS AND CHIMES, PLAYED TUNES OR RANG ALARMS WHEN TAMPERED WITH.

7 SPINDLE DRILL PRESS
CONVERTED TO WET-CUTTING
FOR ONLY $14.25 PER SPINDLE



GRAY-MILLS CONTROLLED-FLOW
PORTABLE PUMPING UNITS

APPLICATION A plant superintendent converting a 7 spindle drill press to wet-cutting, purchased a GRAY-MILLS MODEL G-4A pumping unit for $99.50. The system was hooked up quickly—at a cost per spindle of $14.25 plus a few dollars for piping.

This is just one of the ways that you can convert machine tools to wet-cutting. No longer is it necessary to use make-shift methods—brushes, oil cans and drip cans—use GRAY-MILLS PUMPING UNITS and *produce for greater profit!*

Designed for lathes, grinders, milling machines, broaches, cut-off machines and many others. 14 sizes, capacities 60 to 2640 g.p.h.

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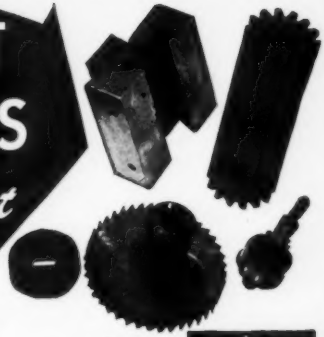

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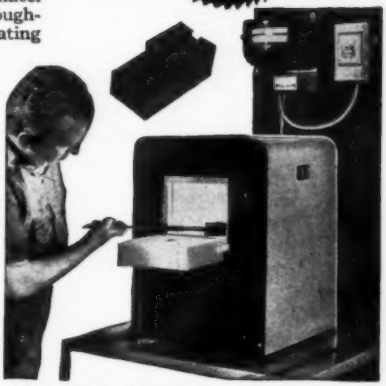

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by DE-STA-CO

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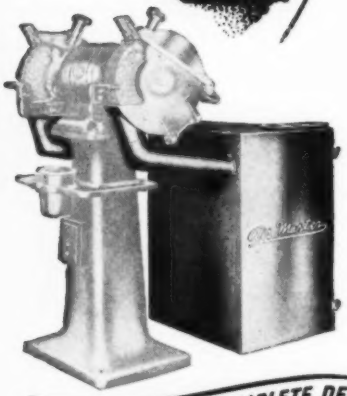

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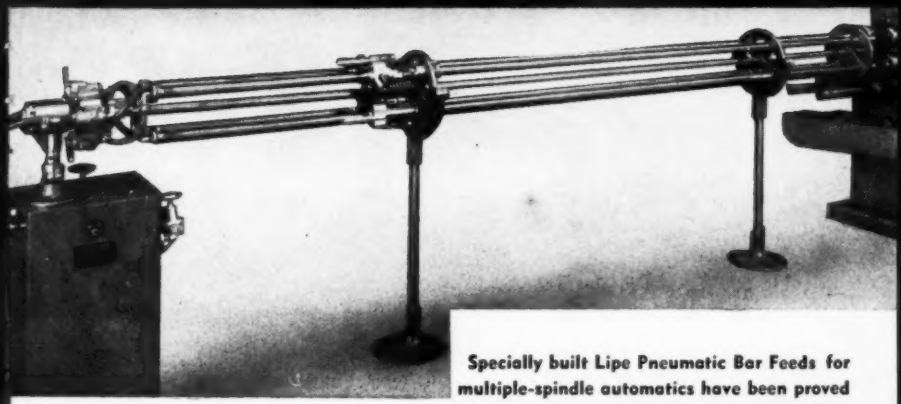

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